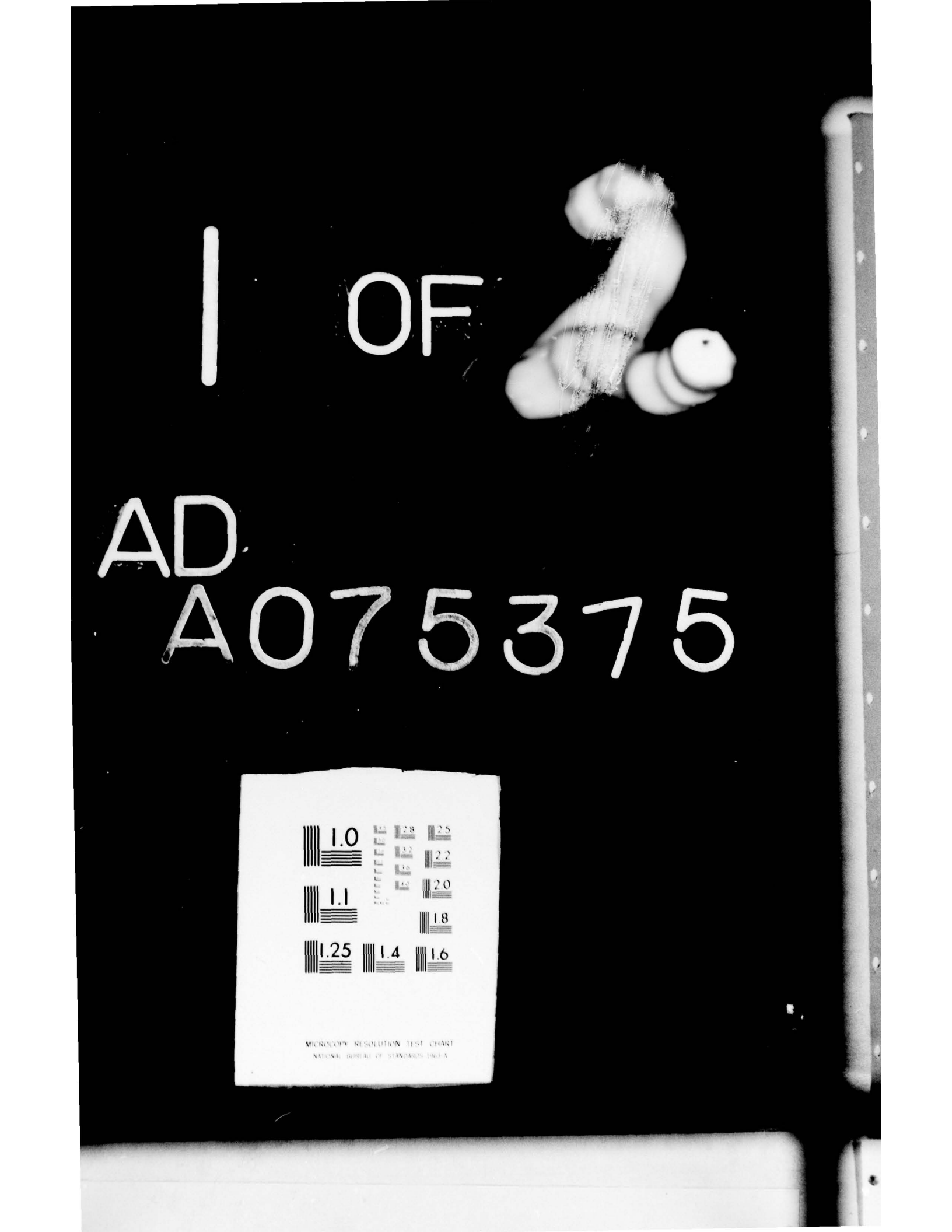
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Operational Manual
Volume VIII

Technical Report Number 13

Looking Glass, Inc. The First Three Years

Morgan W. McCall, Jr.
Michael M. Lombardo

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This is the Final Report to the Office of Naval Research and reviews the development and validation of a simulation of leadership in a complex organization. The report addresses the issue of the simulation's validity by (1) reviewing the development process, (2) comparing activity patterns of managers in the simulation with results from field studies, and (3) examining some results from Looking Glass in relation to findings from studies of organizational behavior. (more)

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LOOKING GLASS, INC.

THE FIRST THREE YEARS

Morgan W. McCall, Jr.

Michael M. Lombardo

Operational Manual Volume VIII

Technical Report Number 13

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Notice

The material contained herein relates to a simulation of managerial performance developed by the Center for Creative Leadership pursuant to a contract with the Office of Naval Research. The context of the simulation is a fictitious corporation in the American glass industry. Any points of similarity between the simulation and an existing glass company are purely coincidental.

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Description of Volumes

Looking Glass is a simulation of a glass manufacturing corporation. There are 20 positions, ranging across three divisions and four levels (Plant Manager, Director, Vice-President, and President). The divisions face different environments, ranging from volatile to stable. Looking Glass is, in a word, typical--the organizational type, structure and environments are common. All problems contained in the simulation are based on actual events.

This is Volume VIII of the Looking Glass Operational Manuals and is the first of several reports that will examine the reliability and validity of Looking Glass and the measures associated with it. In this report, the content validity of the simulation is examined in depth and some preliminary data on construct validity are reported.

Volume I of the simulation materials describes the development of Looking Glass, research issues, training uses of the simulation, and the nuts and bolts of running the simulation.

Volumes II through IV contain the simulation materials. Volume II contains all memos relating to the Advanced Products Division, and also includes organization-wide corporate memos, and all memos to the President. Volume III contains all memos relating to the Commercial Glass Division, and Volume IV, all memos concerning the Industrial Glass Division.

Volume V, the Outside Information Notebook, contains information available by phone to Looking Glass managers. Also in Volume V are detailed instructions for staff members handling "ghost" roles.

Volume VI is a complete index of the simulation materials in Volumes II through IV.

Volume VII contains descriptive data from 10 standardized simulation runs conducted in 1979 and forms a comparative base for researchers and trainers. Included are data on sample demographics, activity patterns, organizational climate, power, information processing and decision making, and performance.

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I. INTRODUCTION

This report is both an end and a beginning. For three years, from September 1, 1976, to August 31, 1979, the Office of Naval Research and the Center for Creative Leadership jointly funded the development of a simulation of management in a complex organization. This is a final report on those 3 years, supplementing previous reports that describe in detail the development of the simulation (McCall & Lombardo, 1978), the simulation materials (Lombardo, 1978; McCall, 1978; DeVries, 1978; Lombardo, McCall, & DeVries, 1978; Kay, Rodriguez, & Lombardo, 1979), and the norm data resulting from 10 standardized runs (McCall, Lombardo, & Rice, 1979). In short, the simulation is now developed and this report begins a new phase by taking the first look at the data it has generated as they shed light on the important issue of content validity.

The Looking Glass simulation was designed as a research tool for generating new questions and new data about leadership in complex systems. In addition to these research functions, Looking Glass, Inc. (LGI), is now in use as a management training tool and is being examined as an addition to graduate education and as a management assessment device. All of these uses demand a close look at the reliability and validity evidence surrounding the simulation. Obviously the simulation is complex and its uses varied; it will be years before all the desirable research can be done. This report has the modest objective of beginning the process by reporting what has already been done, what is under way, and some of the things that ought to be done in the future.

Looking Glass, Inc.

The simulation has been described in detail elsewhere (McCall & Lombardo, 1978; McCall et al., 1979). A brief summary, as well as an organization chart, appear in Appendix A of this report. LGI is a person-centered, free simulation lasting 6 hours. Twenty participants, occupying the top 20 managerial positions of a moderate-sized glass manufacturing company, are allowed to run the company in any way they want. The problems and issues they face enter the system via 20 separate in-baskets. Additional information is available to the managers by telephone or memo, with trained staff responding as appropriate.

Reliability and Validity Issues

Looking Glass can be viewed as having two separate parts: the simulation itself and a set of measures used with it. This distinction is important when considering reliability and validity issues because the desirable characteristics of a stimulus and of a set of measures can be quite different. Most of the standard psychometric procedures were designed for analyzing tests, so the first question is the extent to which LGI is a test. In spite of the incredibly broad definition of a test (APA, 1974, 1975), the answer with respect to LGI is yes and no. Unlike a cognitive or psychological test, or even an assessment center, LGI was not designed to measure a particular construct (or set of constructs) or to predict a specific performance criterion. It was designed to generate relatively typical management behavior. Its inductive origins meant there were no a priori dimensions for which items or exercises were written.

On the other hand, LGI and its associated measures might be used for assessment purposes. In these cases, constructs and/or criteria can be specified, and standard procedures for assessing reliability and validity become crucial.

A useful way to look at Looking Glass is to think about field research. If one were interested in developing reliable and valid selection devices, one would follow traditional procedures applied to the measures and criteria. One would not assess the reliability and validity of the organization itself. With Looking Glass, both the organization and the measures applied to it must be questioned; but it is less clear how one assesses an organization's validity.

The Reliability and Validity of LGI as a Stimulus

What are the relevant psychometric questions to ask of a stimulus? For Looking Glass, the essential questions seem to be 1) are the problems, issues, and events representative of those found in management jobs, and 2) do the managers confronting these stimuli behave in ways that managers in real organizations do? These questions essentially concern the content validity of Looking Glass and are addressed in Sections II and III of this report. Another relevant question concerns whether or not the constructs of organizational behavior--for example the environment-organization relationships reported by Lawrence and Lorsch (1967)--can be found in Looking Glass. Some

preliminary data on construct validity are reported in Section IV.

Other kinds of analyses may be appropriate to Looking Glass as a stimulus, but they seem more questionable and decidedly less central. For example, one might argue that test-retest or alternate forms reliability should be measured. We suspect, however, that these analyses are more informative and appropriate if applied to measures used with LGI, rather than to LGI itself.

As for criterion-related validity, much the same reasoning applies. It makes sense only when the purpose of an LGI run is specified and measures suited to that purpose are used with the simulation. The focus should be between what is measured and the criterion, not between the stimulus and the criterion. Section IV of this report contains one example of a criterion-related study currently under way.

The Reliability and Validity of LGI Measures

The measures we used with LGI during the last year vary considerably and were largely arbitrary. If managers are, in fact, doing the things that managers do, then obviously one should be able to measure a large array of things. We chose to look at the following:

- time sampling and counting of activities
- participant background
- organizational climate
- power distribution
- information processing, decision making, and performance.

As might be expected, the measures used to tap these dimensions range in their reliabilities and the types of reliabilities that are appropriate. The time-sampling strategy (described in Section III of this report and in McCall et al., 1979) involved direct observation of straightforward activities (e.g., is the manager meeting with someone? If so, with whom?). All raters were trained and ambiguous categories were not reported. Other activity data involved counting documents or phone calls. These kinds of data are so well defined that elaborate reliability assessments are hardly cost effective.

Other measures, further removed from well-defined observables, certainly merit reliability checks. The climate measure, a shortened version of the Survey of Organizations (Taylor & Bowers, 1972), was analyzed in McCall et al. (1979) and showed acceptable internal consistencies and scale

discrimination among major subscales. The power questionnaire, which asks participants to do a lot of ranking, will be assessed for interrater agreement now that data are available.

The most difficult measures to assess for reliability are the inductively derived Decision-Making Quesionnaires (McCall et al., 1979). These complex instruments, derived directly from simulation content and tailored to the divisions, Management Committee, and President, ask participants to:

1. Indicate, for major problems they faced, what information they knew, what decision was made, who was involved, who took responsibility, and the perceived quality of the decision

2. Indicate the degree to which a series of possible priorities were identified, who identified them, and what specific actions were taken to enact them

3. Rate themselves, the other members of their division, the President, and their division as a whole on global dimensions of business performance.

From these questions we have derived a series of scales (e.g., tactical and strategic-decision strategies), as well as measures of financial performance.

The strength of these questionnaires lies in their direct relationship to simulation problems and issues. Most of the measures they provide are descriptive: what did you know, what did you do. The primary reliability issue is the interrater agreement when several people, for example all the members of one division, describe the same event. In pretest runs we included a fictitious problem and found that virtually no one claimed knowledge of it. This was comforting, but analysis so far indicates considerable disagreement among participants on what they did. On the basis of simulation debriefings, and judging from triangulation studies of managers (see McCall et al., 1978), we believe that this disagreement is reflecting reality rather than poor questionnaire properties. The managers of LGI, like managers in real organizations, are often not informed about decisions made or changed during the course of the simulation. Data are being analyzed to determine interrater agreement, but we believe agreement on the descriptive items is a variable of substantive interest rather than a psychometric problem.

Other measures derived from the questionnaire, especially scale scores, are being subjected to traditional reliability checks, including internal consistency and item analyses.

Because the reliability analyses outlined above are not yet complete, this report is limited to developmental procedures germane to content validity and to the directly observable or countable data.

Validity analyses of the various measures we have used with LGI are also under way, but the important validity questions are totally dependent upon the purposes for which the measures are used. From a research perspective, major issues involve construct validation; assessment uses dictate criterion-related validity studies (Nunnally, 1967). Section IV of this report gives an example of what can be done with construct validation and outlines some criterion-related and construct-validation studies planned or under way.

An Overview

Looking Glass was designed as a tool for generating new questions about leadership in complex organizations. We felt that the additional control possible with simulation, as well as the researchers' complete knowledge of the system he or she was studying, make simulation an important complement to field studies. Further, the complexity of LGI, including as it does environmental and structural elements of organizations, permits the integration of the micro and macro thrusts in organizational behavior.

It is, ironically, the very richness of the simulation that makes reliability and validity issues difficult to sort out. The complexity of the domains we have tried to simulate means that years could be spent trying to determine that, for example, LGI is really a "typical" profit-making organization. Content validity is essentially a judgment call (APA, 1975), and the goal of this report is to help others make that judgment of LGI as a stimulus. We believe also, however, that the issues discussed here extend far beyond this particular simulation. Even considering the financial and time constraints, we know of no other simulation as carefully developed for purposes of research on such a complex and broad domain of organizational life. LGI can be seen as a test case of whether or not simulation methods can contribute substantially to our understanding of organizational behavior and leadership.

II. THE DEVELOPMENT OF LOOKING GLASS

In 1976 we began the development of a complex organizational simulation. Because we believed that management, like art, must be viewed in its entirety to have meaning, we sought to stay as close to the diffuse reality managers face as we could. In short, we set out to:

- accurately simulate the content and activity patterns of the managerial job
- build a typical organization facing multiple environments
- let managers grapple with the organization's problems any way they chose
- find out about leaders "on line," dealing with the complexity and confusion of organizations.

This section deals with several aspects of content validity: Is Looking Glass representative of the domain of organizations? Do managers in Looking Glass perform tasks and activities that are representative of the domain of managerial work?

As has been discussed before, the usual components of validity do and do not apply to Looking Glass. It is and is not a test; the domains we sought to represent are unknown and probably unknowable. As such, we could never know whether or not we had sampled adequately, because the domains were both enormous and fuzzy.

Our choice was to build inductively within the general framework of what was known about organizational structure, type, and environments; and managerial job content. During the first year we conducted literature reviews in leadership/management, organizational structure and environment, and organizational simulation literatures. Our conclusion was that a gap existed in the literature: while much was known on both the micro and macro ends, little was known in the middle range--the problems and activities that make up the content of the managerial job, or what <u>specific</u> organizational structures and environments looked like. Most of what we reviewed was simply too narrow or too general to guide us.

While we built inductively, we tried to adhere to the tenets of content validation. We defined the domain as upper-level management positions in typical profit-making organizations, and more specifically, as the tasks, activities and responsibilities involved in carrying out

these positions. Within practical limits, we used the most qualified experts we could find--top-level managers, and financial and organizational consultants.

But essentially, content validation is a judgmental process, and in that spirit, we present this process as it related to the criteria used for organizational selection, organizational structure, environments, managerial job content, design features of the simulation, and the measurement system.

Selecting an Organizational Type

We developed 12 criteria for selecting a typical organization (see Figure II-1 for complete list). Operationally, this broke down into two requirements: 1) credible to participants, and 2) practical for us to design. Credibility meant that whatever we selected had to have an analog in the real world. The structure, environment, technology, and products had to exist. We wanted participants to feel they were producing something important, rather than frivolous or fictional goods such as widgets.

Further, we wanted an organization that managers were likely to have heard of but unlikely to have worked in. This argued for an older, fairly small industry, making common products. Since no detailed knowledge of the organization was to be necessary to run it, its jargon and processes had to be simplifiable.

The decision to simulate a profit-making organization was based on familiarity of organizational structure. Most managers are at least acquainted with for-profit setups, while many nonprofit organizations have unusual structures. Educational organizations, for example, are controlled by political agencies (legislatures and school boards). Hospitals are actually two organizations in one--the bureaucracy run by managers and the service run by professionals. Since we wanted participants to feel "at home" and believed that additional complexity would be confusing, nonprofit organizations were ruled out.

Practicality of design required that we select an organization with identifiable environments and technologies, and a product line homogenous enough to be simulated. Although the organization must vary in what it produced to give us some leeway in design, the problems it faced must be generic to make it representative to participants. Personal

contacts and information had to be available, and the organization had to be interesting to the staff.

Using Standard and Poor's classification of organizations, Business Week's surveys of corporate profits, and our knowledge of organization types, we narrowed a long list down to 22 organizational types with promise as "typical" organizations. These were: 1) publishing, 2) shipbuilding, 3) toys, 4) sporting goods, 5) oil service, 6) food products, 7) recreation, 8) motor freight, 9) air freight, 10) broadcasting, 11) paper, 12) measuring instruments, 13) ceramics, 14) airlines, 15) glass, 16) prosthetics, 17) oil field machinery, 18) metal casting, 19) forestry, 20) fishing, 21) cargo, and 22) lumber. After matching each organizational type with the list of selection criteria in Figure II-1, two finalists emerged--shipbuilding and glass. We brought in two former managers to explain the nature of each organization. As a result of their extensive presentations on environments, technologies, structure, and products, the decision became obvious. Glass was more versatile along all the criteria.

Selecting an Organizational Structure

Using charts from several organizations in the glass business, charts from other types of organizations, "ideal" models from the literature, and Henry Mintzberg's presentation on five general types of organization (later published in 1979), two structures were drawn for the simulation. Both structures were adaptable--with minor changes in managerial titles and events, the structure could be switched from divisional to functional across runs.

Our original design called for 11 to 16 roles in either 2 or 3 divisions spread across 4 levels--President, Vice-President, Director, and Plant Manager, and 3 functions--Sales & Marketing, Manufacturing and Product Development. Although our decisions were somewhat arbitrary, we attempted to select the most common structure, and functions, and to include top management positions from the president to the chief operational managers.

As we interviewed incumbents of these positions, we began to have compunctions about our structure. The organization was diamond shaped rather than pyramidal. Some of the major problems we wished to include would not flow well from one Plant Manager through three Directors to one Vice-President. We grappled with this problem throughout 1977, deferring the final selection of live roles until our

field interviews were completed. One theme permeated our thinking during this period: To be real, the simulation would need closer to 20 live roles and an unspecified number of "ghost" roles to make the organization more pyramidal. Otherwise, we would have top managers with no one to supervise.

Selecting Environments

Picking a typical organization to simulate was a trivial problem compared with selecting environments. Environment, as one of us said, is conceptually equivalent to "everything" and "they." The environmental literature was simply too global and obscure to be of much use in designing a specific environment. Our goal was to have the divisions face environments that varied along criteria such as volatility, degree of competitiveness, and nature of the markets. This resulted in three clusters corresponding with our three divisions: 1) volatile, 2) moderately unstable, and 3) stable. Classifying products according to the stability/instability of their environments was straightforward.

What vexed us was how to vary environments in a practical sense--which dimensions to manipulate and which to leave alone. With no agreement from the literature on the nuts and bolts of environments, we searched for a theme and found it in environmental uncertainty. Uncertainty consisted of two dimensions: static vs. dynamic and simple vs. complex.

Static vs. dynamic. The two major elements seemed to be rate of change (how often factors change or new ones need to be taken into account) and hostility (rapidity of required response, pressure from competitors, customers, government, and scarcity of raw materials) (Duncan, 1972, see Figure II-2).

Simple vs. complex. How many elements are relevant to the organization and how many classes do they represent? The former consisted of sheer number, the latter a hodgepodge of elements (e.g., customers, raw materials, government regulations).

Complexity of environment did not become a variable. We spoke with no high level managers in major organizations that faced a simple environment.

The elements that stood out as important environmental components were:

1. Legal/regulatory factors: legislation; federal, state, and local agencies; professional and/or trade associations; and industry standards.

2. Pseudo-member factors: boards of directors; stockholders; and financial institutions.

3. General socio-economic factors: interest rates; political conditions; GNP; military, consumer, construction, and education spending; cultural, social, and community norms; special interest groups; and public opinion.

4. Input factors: suppliers (number, reliability, strikes); raw materials; fuel; leasors; labor supply; and investors.

5. Throughput factors: technological innovation; patents; impact on physical environment; equipment condition and availability; labor mobility; unions; and subcontractors.

6. Output factors: customers (number, reliability, strikes, cycles); competitors; and markets.

Boiled down to operational terms, the environments faced and the resulting divisional characteristics were:

Advanced	Industrial	Commercial
(volatile)	(moderate)	(stable)
heavy competition, exotic materials, costly processes, dependent on innovation, connected with military spending, contract oriented, diverse product line, many markets, specializing in precision, unpredictable profits, products obsolete quickly, crises common, high pollution costs, brief history	tied to consumer and government spending, diverse products, unreliable customers, some exotic materials, sales ceilings, foreign competition, customers take over technology, profit margins erode	few customers, long history, some competition, high volume, certain market, tied to GNP, slowly changing technologies, products are essential, forecasts stable

Objectives:

Advanced	Industrial	Commercial
specialize in precision market, customer service	respond to customer tastes	reduce cost to maintain market position

Problem/Activity Clusters

The face validity of Looking Glass comes in large part from our decision to discard a proposed questionnaire survey of managers and conduct field interviews. All problems which managers face in the simulation are modeled on what they told us they faced on the job. The structure of the interviews, conducted primarily with glass industry managers between April, 1977, and February, 1978, consisted of what they do in a typical day--process and content (see Figure II-3). More than 25 interviews were conducted, the most relevant ones in two major glass corporations. Positions interviewed ranged in level from Plant Superintendent to President. Interviews lasted from 90 minutes to over 2 hours.

Working with interview notes, we extracted and listed 200 events and problems on index cards. Five of us then independently sorted these cards according to apparent similarity, without a priori categories. The sorts were compared, disagreements battled out, and 12 activity clusters generated (see Figure II-4; for a similar clustering, see Mintzberg, 1973). The clusters were used for two purposes: 1) to insure a representative set of demands during the writing of the simulation and 2) to form a series of dimensions along which problems and activities varied.

Problem Dimensions

Using previously published taxonomies of tasks (Shaw's, 1973, classification, for example) proved simultaneously too limiting and too general. The problems we developed were too complex for any of the standard task taxonomies. After another series of meetings, we developed our own to capture the complexity of what managers do (see Figure II-5). These variables were used: 1) to ensure variability within and across managerial roles, and 2) as a guide for selecting and classifying problems.

Financial Data

Early on, we realized that without some financial data the simulation would be a farce. The managers we interviewed for this project understood and used numbers as common parlance. As a bank manager told us, "I feel naked without my profit ratios."

During our interviews, managers told us the key figures they focus on in the mass of data they receive. We used these in having Robert Taylor of Duke University guide us in constructing a simplified financial management system. (Later, we also relied heavily on the advice of J. J. McMurry of the Smith Richardson Foundation and Center for Creative Leadership.) He introduced us to such arcane entities as balance sheets, debt/equity ratios, and cost of goods manufactured. Our goal was to include the key figures managers use to flag problems at the plant, divisional, and corporate levels.

Designing Looking Glass

We began the design of the simulation armed with stacks of miscellany: notes on interviews, plant tours, glass technology, history of glass making, annual reports, financial and business reports, glass industry articles, explanations of terms like electrostatic precipitators, and the inevitable potpourri of textbooks.

Each investigator was to design one of the divisions. In writing, we included: 1) relevant environmental constraints, 2) major strategic and operational problems, 3) cross-divisional problems, 4) division history and product information, and 5) relevant facts and figures. In addition, problem development was guided by our management activities clusters and problem dimensions.

Things to Do

To replicate reality, there were several imperatives:

1. Hide the critical among the irrelevant. We found no evidence that problems come wrapped in packages with red warning flags attached, or that they arrive in any intelligible sequence.

2. Throw clinkers into the furnace. The management job takes place amidst any number of annoying events. During a typical day, there will be rumors, memos going to the wrong people, staff unavailable because they are in a scheduled meeting or on vacation, and information which could be but has not been found. Although we did not deliberately make Looking Glass chaotic, we sprinkled in a few annoyances for reality's sake.

3. Be lively. Since each participant had to read the 35-50 memos we placed in each in-basket, we kept the memos brief and conversational to prevent them from dozing off. In essence, we tried to make the organization a living thing--a novel rather than a textbook.

4. Keep it simple. Although the temptation to be deviously complex was at times overwhelming, we resisted this as much as possible. The nature of the job, the complexity of human interaction, and the uncertainty associated with many of the problems

made the managers' task devilish enough. Avoiding overcomplexity probably contributed greatly to the eventual success of the simulation. Where we did succumb to our proclivity to complicate, the problems were so obscure that they went unnoticed.

5. Spread information around and outside the organization. Much useful information arrives from staff specialists, customers, competitors, and field representatives. We included a high percentage of memos and letters from these "ghosts." One "ghost," the Corporate Controller, had such a volume of critical information that 20-30% of the telephone calls and memos to outsiders went to that "position."

6. Let the financial system reflect, not create problems. We selected numbers that indicated what was already known via memo. For those familiar with cost accounting, the figures could be used and others requested; for those unfamiliar, explanations were provided. Regardless, the problems could be attacked either way. If, for example, a plant had production problems, they popped up in both the financial data and the memos. If production was running smoothly, the numbers were blandly on target.

The Context

The physical elements surrounding the simulation serve three basic purposes--ease of communication, emphasis of status differences, and representation of reality.

The telephone system. The telephone is an integral part of a manager's life and one method of collecting unobtrusive data on interaction patterns. Two Center staff technicians built a 20-phone system with a central switchboard so we could record calls, tape them automatically, and permit contact with "ghosts." This homemade system was later replaced by a 22-line, solid-state one.

Mail system. We included routing slips and pressure-sensitive paper to enable managers to communicate almost as easily as they would on the job. For example, by stacking five sheets and clipping on a routing sheet, a manager could write one memo with four carbon copies that we would then deliver during mail pickups.

Accoutrements. We provided office locations, desk plates, ash trays, and pen sets according to the status of the position. The President, for example, received a

blotter, pen set, large ash tray, expensive desk plate, and the largest office (or work area).

Pretesting Looking Glass

The eight pretest runs with different organizations (and one informal pretest in the United Kingdom) confirmed that Looking Glass worked. Participants (about 85% were managers) stayed occupied and in role even during lunch. A few positions were overwhelmed, a few underwhelmed, and the financial system needed additional development; but overall, the problems and roles ran as expected.

Our conclusions as a result of these runs were:

1. Looking Glass is robust--it was meaningful for managers from industry, government, banking, and education.

2. The divisions, designed to produce different behaviors in response to different environments, did in fact produce contrasting response styles. Identifying what those differences were and profiling them was a goal for the research runs during the final year.

3. Organizational differences in management approach were reflected in behavior during the simulation.

4. Through comparison of our time sampling of managerial activities and managerial self-reports, we could say that the behavior of managers in Looking Glass was, on the whole, representative of their behavior back on the job.

Measuring the Content of the Managerial Job

The only fair test of content validity is to ask if a measure contains an adequate sample of the domain in question. In spite of thousands of studies in the leadership/management literature, the domain of managerial work remains elusive. Managerial functions, attitudes, styles, and activity patterns have been researched exhaustively, but what kinds of problems managers face, in what mix, and what environments they cope with, remain largely a mystery. The most helpful reference points we had from the literature were Mintzberg's (1973) study of chief

executive offices and earlier work by Sayles (1964). In addition, we had numerous case studies, interviews with managers, and comments from managers who participated in Looking Glass.

By matching our problem/activity clusters with Mintzberg's and by questioning managers, we were confident that our description of managerial job content was as good as any. Looking Glass did indeed recreate a typical day in the life of a manager, or more colorfully, "Looking Glass is a Monday."

But what did it all mean? If the stimulus covered the domain, we should be able to measure the basic activities expected of managers. We knew that in Looking Glass, information got processed, decisions made, money spent, and so forth. To get some reasonable measures of what managers do we decided to focus on three critical elements of the managerial job:

- information processing
- decision-making practices
- financial outcomes

We constructed five decision-making and information-processing questionnaires that focused on specific information that could be shared and decisions that could be made during the course of the simulation. Figure II-6 contains a listing of some of these measures. A more complete description of the variables and their development is in McCall et al., (1979).

Is Looking Glass Content Valid?

Except for the inherent limitations of simulation, Looking Glass is a reasonable depiction of the content and activity patterns of managerial work. Nevertheless, certain caveats apply.

Skeletons. Simulations are skeletal reality. There are no products; no one will be fired or promoted. They are game-like in nature and as such their reality depends on the tendency of people to enjoy complex experiences, to want to complete tasks, and to associate the simulation content with their actual job content. Simulations have artifacts as a given.

Paper crises. All problems given to participants at the start of Looking Glass appear in the form of memos (the failure of a plant to pass EPA inspection is an example). In an actual organization, managers first learn of many problems over the phone or face-to-face. After these initial inputs the simulation is realistic as managers tell one another what their problems are.

The decision to use memos to introduce problems was a trade-off between loss of reality and what were more important losses. By intervening (with a phone call, for example), we felt we would create strong experimenter demands to drop everything else and engage in crisis rather than typical behavior, upsetting the normal activity patterns of managerial work. Checking this assumption during a pretest run confirmed our fear--one phone call from a "reporter" resulted in three hours of activity on a minor problem by the entire organization.

Time. Simulations ordinarily compress time, either by forcing decisions or by providing enough information so that a decision is likely. Even though decisions must be made on only two of over a hundred problems facing our organization, more decisions are probably made than in a typical day. Unlike life, the participants know that the simulation will not go on.

No subordinates. The lowest management level in Looking Glass is Plant Manager. Because the Plant Managers have no live subordinates, we attempted to make their positions more real by allowing them access to their plants and subordinates by telephone.

External contacts. Although we included memos and letters that concerned outsiders and allowed phone calls to them, we could not replicate the large percentage of time (Cohen & March, 1974; Mintzberg, 1973) that senior executives spend with external contacts.

A reasonable case for the content validity of Looking Glass can be made. In developing it, we used real environments, real products, and real problems in about the mix they occur for managers. The simulation was based on typical days as described by managers in similar positions. Each manager faces a representative array of problems and events within a familiar context (phones, mail systems, an office, etc.). How information was shared, good or poor choices made, and what impact these had on financial performance are fair measures of the content of what managers are expected to do.

Looking Glass is a content valid measure of the managerial job in complex organizational settings, but it is not the job and not an organization. Rather it is a sensitive photographic plate that records traces of elusive, shifty phenomena. These traces, like shadows, only indicate what might be asked and what answers might be found in another reality.

CRITERIA FOR CHOOSING ORGANIZATIONAL TYPE

1. Credibility to participants
   (basic familiarity, actually exists, makes important products)

2. Of interest to staff who had to design it

3. Contacts and information available on the industry

4. Discrete
   (not a huge, amorphous conglomerate)

5. Certain stability in types of problems faced by the organization

6. Simplifiable
   (low jargon)

7. Variability
   (in environments, technology, products)

8. Profit making

9. Obvious analogs to any organization
   (not a crisis organization)

10. History
    (40 - 50 years)

11. No detailed familiarity for most managers

12. Degrees of freedom--could be adapted without losing critical features

Figure II-1

CHARACTERISTICS OF VARIOUS ENVIRONMENTAL STATES

	Simple	Complex
	CELL 1: Low Perceived Uncertainty	CELL 2: Moderately Low Perceived Uncertainty
STATIC	1. Small number of factors and components in the environment 2. Factors and components are somewhat similar to one another 3. Factors and components remain basically the same and are not changing	1. Large number of factors and components in the environment 2. Factors and components are not similar to one another 3. Factors and components remain basically the same
	CELL 3: Moderately High Perceived Uncertainty	CELL 4: High Perceived Uncertainty
DYNAMIC	1. Small number of factors and components in the environment 2. Factors and components are somewhat similar to one another 3. Factors and components of the environment are in a continual process of change	1. Large number of factors and components in the environment 2. Factors and components are not similar to one another 3. Factors and components of environment are in a continual process of change

Reprinted from "Characteristics of Organizational Environments and Perceived Environmental Uncertainty" by R. B. Duncan, published in Administrative Science Quarterly, 1972, 17, p. 320, by permission of Administrative Science Quarterly.

Figure II-2

"TYPICAL DAY" INTERVIEW GUIDE

I. Introduction

- Self
- CCL (if necessary)
- ONR Project
- Confidentiality
- Outline of interview

II. General Description of Job

- Basic responsibilities

III. Typical Day

- Can be real or hypothetical day, using calendar records
- Hour-by-hour account (what-who-when-why)
- Only enough detail to be understandable

IV. Details

- Probe specific events in day
- Content, relationships, frequency, regularity

V. Differences

- How would other days differ
- Larger perspective (time traveling, cyclical events, etc.)

VI. Thanks

- Executive summary
- Possible future involvement (observe simulation, comment on events, participate, etc.)

Figure II-3

PROBLEM/ACTIVITY CLUSTERS

Activity	Definition	Examples
1. Symbolic	Activities in which the manager represents symbolically or ceremonially the unit or organization.	Going to anniversary dinners; attending retirement parties; making speeches; joining civic organizations.
2. Staff development and education	Deciding on and arranging for educational and developmental activities for oneself, one's staff, or the organization; also performing mentor roles.	Requesting OD help; picking university courses; detecting lack of financial education in the organization; meeting with consultants or taking personal time to help staff.
3. Monitor	Gathering information on the progress of work; looking for deviations.	Visiting production sites; reviewing engineering strategies, subordinate performance, financial and production statements.
4. Disseminator	Informing others of unit or organizational activities; basic information sharing.	Budget reports; informing other divisions of activities; distributing statistical summaries on departmental issues; explaining sensitive issues to those concerned.
5. Entrepreneur	Finding or creating opportunities to improve work activities.	Examine requests for new products, proposals to diversify product lines, new advertising campaigns; prepare competitive bids; invest in land or other corporations; take greater advantage of tax credits.

Figure II-4

6. Resource Allocation	Using available resources (human, technical, mechanical, physical, financial) for work accomplishment.	Project planning; arranging loans; interview job candidates; staffing arrangements after transfer or promotions; sub-contracting.
7. Hip Shots	Taking immediate action in response to a serious problem.	Cost over-runs; change in sales or production forecast; pollution or affirmative action problems; emergencies (strikes, fires, etc.).
8. Persuasion	Using influence to gain some control over forces which are not directly controllable.	Choosing board nominees; testifying at trade associations; selling new products internally; negotiating contracts; requesting major expenditures; negotiating with government officials; finding adequate housing for employees; getting community improvements.
9. Structuring and Design	Changing organizational structure to improve work processes.	Reorganize divisions; set up depreciation or budgeting procedures; set up reporting relationships, staff meetings, etc.
10. Routine Administration	Taking care of formal requirements.	Reviewing applications; in-basket materials; MBO reviews; coordination of paperwork; estimate costs and issue purchase orders on routine matters.
11. Network Construction	Joining or participating in activities to create potentially useful contacts.	Serving on external boards and in community groups.
12. Nuisances	Time-consuming events not directly related to organizational goals.	Customer complaints; phones out of order; interruptions.

Figure II-4 (continued)

PROBLEM DIMENSIONS

1. Interdependence

   - Others have information necessary to defining the problem or to finding an appropriate solution.

   - Others are directly affected by the decision, e.g., they control inputs or outputs or share a common fate.

   - Solving the problem or engaging in the activity requires the help of others.

   - Procedures require that others be involved.

2. Difficulty

   - Problem is unclear or changing.

   - Problem is interdependent.

   - Problem has many elements or pieces.

   - Elements are diverse.

   - Solution requires persuasion.

   - Actor has partial or no control over the elements.

3. Magnitude

   - The way the problem or activity is handled will influence, in a big way, people, money, etc.

   - The problem is highly visible.

Figure II-5

EXAMPLES OF INFORMATION AND DECISION VARIABLES

1. Problem Identification

The extent to which key information relevant to identifying the existence of an important problem is disseminated to members of the divisions. For each problem, keyed items are one or two pieces of information that are a tip-off, trigger, clue to recognizing the generic problem. They are the keys to the biggest bucket.

2. Maybe-It-Will-Go-Away

The extent to which decision choices reflect a tendency to continue things the way they are, implying self-deception or an unjustified hope that the problem will go away if it is ignored long enough. Keyed items are decisions that will serve to continue things basically as they are, that represent superficial responses to a problem.

3. Solution Expansion

The extent to which chosen problem solutions reflect a tendency to go beyond the data given at the start of the simulation. Keyed items are choices that were not directly suggested as solutions to the problem by information available at the start and typically represent a broader search for solutions. These are not necessarily creative or nonobvious (though they may be), but they clearly require going beyond the givens.

4. Decoupling

The extent to which decision choices are likely to generate conflict with other divisions or to sever interconnectedness among divisions. The keyed items are likely to create disagreement over goals or means to goals, including competition for resources, encroachment of product lines or customers, and creation of inequities. The likely result of such actions is isolation of the division, i.e., decoupling.

5. Tactical Decisions

The extent to which decision choices tend to be temporary or short-term solutions to the problem. In some cases, these may be appropriate solutions, but they may also be the choices aimed at pieces of the problem or only temporary solutions of the problem.

Figure II-6

6. Strategic Decisions

The extent to which decision choices reflect a long-term perspective on the problem. Keyed items may not provide an immediate solution, but they do represent a long-term strategy aimed at solving the problem in the long run. They tend to be more comprehensive, more complex, and require more time to implement than tactical decisions.

7. Designer

The extent to which solutions reflect a tendency for trying to solve problems by direct manipulation of organizational structure. Structure is defined as procedures, policies, and reporting relationships. This scale would not include solutions--such as acquisition, divestiture, or plant changes--that might result in structural changes but for which structure is an outcome rather than an antecedent.

8. Investment

The tendency to choose solutions involving large expenditures. Items assigned to this scale should represent relatively "big ticket" solutions.

9. Coupling

The extent to which decisions create interdependence among divisions, for example, entering into formal relationships on internal transfer or personnel exchanges.

10. Response to Internal Pressure

Percent of problems on which a decision was made that have their cause primarily within the division itself.

11. Response to External Pressure

Percent of problems on which a decision was made that have their cause primarily outside the division, either in the external environment or in another division.

12. Problem Difficulty

Identification of the five toughest problems facing the division (a combination of the interdependence requirements, magnitude, and difficulty).

13. Good Choices

Decisions coded by the designers as acceptable responses to the problems. Decisions are weighted as 1, good choice; 2, best choice.

Figure II-6 (continued)

14. Poor Choices

Decisions coded by the designers as inappropriate. Decisions are weighted as 1, poor choice; 2, potentially disastrous choice.

15. Information Diffusion

Divisional gain or loss in information compared with what information was available to division members at the start of the simulation.

16. Upward Communication

Knowledge of information by upper-level managers that was held exclusively by lower levels at the start of the simulation.

17. Downward Communication

Knowledge of information by lower-level managers that was held exclusively by upper levels at the start of the simulation.

18. Lateral Communication

Sharing of exclusive information among Directors and among Plant Managers.

19. Outside Information

Exposures to information that originated outside the division (APD & CGD only).

20. Telephone Requests for Information

Average number of requests per position; average number of original requests for information from outside information notebook; percent of outside information available that entered each division.

21. Return on Investment

Change in the ratio of net profit/total investment.

22. Opportunity Costs

What managers could have done that they did not--lost profit opportunities.

23. Debt/Equity Ratio

Change in the ratio of total debt/corporate equity.

Figure II-6 (continued)

III. ACTIVITY PATTERNS IN LOOKING GLASS

Introduction and Rationale

Section II of this report examined the content validity of Looking Glass by reporting the procedures followed in developing the simulation. This section looks at content validity from a different angle. By preserving as much contextual reality as possible, Looking Glass attempts to generate typical managerial behavior. In short, Looking Glass should serve as a stimulus: when managers confront the simulation they should go about their work just as managers do in real organizations. A key content-validity issue, then, is whether or not managers in Looking Glass behave similarly to managers in organizational settings.

The most direct way to test this is to look directly at behavior. Fortunately, there are about 40 studies of managers that have used structured observation or diary methods to record what managers do (McCall, Morrison, & Hannan, 1978). These studies formed a comparative base we could draw on for use with LGI. By systematically observing and recording how LGI managers spent their time, counting the memos they wrote, and logging their use of the telephone, we could find out how closely their activities coincided with those of managers in the field.

Simulations--even when designed as rigorously as Looking Glass--have inherent limitations. For example, limits on the number of participants restricted the number of "live" subordinates LGI managers could have. Only 7 of the 20 LGI managers have direct reports on-site. Practicality dictated that LGI managers would not have secretaries, and would therefore have to place their own calls and write their own letters. No matter how we organized the introductory evening, LGI managers always started the day without the familiarity they have on the job.

All these and other simulation artifacts told us not to expect an exact coincidence between LGI activity patterns and the results of the comparative studies. Still, if the goal was to generate managerial behavior, we had better be in the right ball park.

This section first reports the results of structured observation of the activities of LGI managers and compares these results with selected studies done in real organizations. Second, we report results from mail and phone records of LGI managers and compare them with other studies.

Finally, we address the question, "how close to reality did we come?"

Structured Observation

Procedures

A recent review of diary and observational studies of managerial work (McCall et al., 1978) indicated that these studies vary considerably in the specific categories measured and in the measurement procedures. To make the LGI study identical was impossible, but we sought to design our procedures in basic accordance with what others had done. We tried to juggle practicality with the best methodological features from the field studies.

In consultation with Bob Hannan and after reviewing the methodologies used in various studies, we decided that a random time-sampling design using the simple, observable categories "what," "where," and "with whom" made the most sense.

The sampling strategy was based on 2 observers recording the activities of all 20 LGI managers in randomly assigned 10-minute blocks. Sampling began after the 45-minute familiarization period, was suspended during the scheduled lunch break, and continued until the President's Address (the close of the simulation). This meant that each run generated a minimum of 400 minutes of structured observation (20 participants X 2 observers X 10 minutes). If observers completed the required 20 observation periods before the simulation ended, additional random, 10-minute observations were made.

The categories observed and reported here are described below (the observer form appears in Figure III-1):

What?

paperwork--reading, writing, thinking, shuffling papers, etc.

telephone--engaged in conversation over the phone

meeting--in conversation with one or more other people

other--walking around, waiting to see someone, getting coffee, etc.

Where?

own office--activity took place in the target person's assigned office space

other's office--activity took place in another participant's office

conference room--activity took place in the designated conference area

other--someplace else, for example in the halls or cafeteria

With whom?

subordinates--people who report to the target person (The Directors of Product Development and Sales & Marketing and the Plant Managers have no subordinates present during the simulation. They were not counted in this tally.)

superiors--boss of the target person (Only the President has no superior during the simulation.)

colleagues--managers who report to the same boss

fellow specialists--managers who perform similar functions in different divisions of the organization

In analyzing the data, the total minutes a particular category was observed was divided by the total minutes of observation. Data are reported as a percent of total time.

Several categories appearing on the form were combined or dropped for this analysis. Because observers frequently could not tell if a meeting was scheduled or spontaneous, we combined the two categories into a single "meeting." The percent of time spent on things like walking and waiting were so small that we lumped it under "other." The initiator of an interaction was so frequently unknown that the category was dropped entirely. "Topic" was codable, but we have not yet analyzed these data.

The Comparative Base

Prior to looking at the LGI data, we selected nine field studies to serve as a comparison group. We tried to pick studies meeting as many as possible of the following

criteria: 1) included at least middle- and preferably upper-level managers (LGI is an upper-management simulation); 2) was methodologically sound and reported results in a complete manner (many of these studies were not and did not); 3) used at least some of the same categories we had chosen; and 4) had results that could be converted to percent of total time (if not reported that way initially). Not all the studies met all the criteria. For example, Hinrichs's (1964) study did not include upper-level managers but was methodologically one of the best. The nine studies we selected are described in Figure III-2. Table III-1 shows the results of these studies for the categories of behavior used in the LGI time sample.

Having chosen the studies, we then had to choose units of comparison. The nine studies varied in terms of method (diary or observation), sample size (3 to 232), organization type, and levels of management included. We felt that the range of means, rather than a grand mean, was the best unit for comparison. Table III-1 shows the ranges used as a comparison base for LGI.

The Population

The LGI data reported here are based on 10 standardized simulation runs conducted in 1979. The population is described completely in McCall et al. (1979). It contained 80 participants from a bank, 100 from 2 different manufacturing concerns, and 20 from various organizations. Of the participants, 92% were managers in their real organizations, and 28% of them were from top- and upper-middle levels. They represented 11 functional areas, with the largest percentages from finance (39%), administration (30%), personnel (29%), engineering (18%), and manufacturing (16%).

Results

Overall data from the 10 runs of LGI are reported in Table III-2 and compared with the ranges of results from the 9 field studies. In the "what?" category, the table shows that LGI managers spent more time on paperwork, the same amount of time on the phone, and slightly less to the same amount of time in meetings when compared to managers on the job.

The higher percentage of time LGI managers spent on paperwork was not surprising given their lack of familiarity

with the company, the absence of secretarial support, the many positions without live subordinates to interact with, and the accessibility of corporate staff and outsiders only by phone or memo. Most of their initial information about the company comes in written form, perhaps inducing a paper mind-set at the start.

In the "where?" category, LGI managers spent more time in their own offices than the comparison group did, but about the same amount of time in other's offices. The comparison studies were based on several days or weeks of observation and the target managers went wherever they wanted. In LGI managers were sampled one day only and their movement was restricted to the run facility. We expected, therefore, to see LGI managers spending more time in their offices and less time in "other" places.

"With whom?" showed reasonable concordance with the comparative studies in terms of time with subordinates, but LGI managers spent more time with superiors and colleagues. Again, the absence of other corporate personnel with whom to interact face-to-face is a major factor, as is the presence of the LGI Plant Managers on their bi-monthly visit.

Overall, in spite of the deviations, the results put LGI in the right ballpark. Had time samples been gathered during the 45-minute lunch break, a heavy meeting time for LGI managers, the percentage of time in meetings would have gone up and time on paperwork down.

While nothing can be done about the limits on the number of participants and the physical space, other explanations of the differences between LGI and the comparison group could be examined. Because most of the comparison studies were based on experienced line managers, and because paperwork decreases as level increases (McCall et al., 1978), we thought our population (which contained a mixture of experienced and inexperienced, line and staff, and upper- and lower-level managers, see McCall et al., 1979) might be having effects on time allocation patterns. Further, the level of the manager in LGI itself, or the division of LGI to which a manager might be assigned, might be affecting activity patterns.

Table III-3 reports the activity patterns of LGI managers with different backgrounds: higher versus lower level of management, line versus staff, and experienced versus inexperienced. The differences in general were small, particularly for line versus staff. Experienced managers and managers with upper-level jobs back home tended to spend less time in their own offices, less time on paperwork, and more time meeting. In sum, backgrounds of the LGI managers did

affect activity patterns: LGI managers with backgrounds more like those of managers in the field studies produced activity profiles quite similar to those from the field studies.

We thought that lack of familiarity with LGI might affect time patterns, so we looked at activity profiles at different times of the day. We predicted that activity profiles would approach the comparison group as the day went on. By later in a run, managers should be more comfortable with LGI and spend less time referring to their in-baskets. Further, two studies (Cohen & March, 1974; Mintzberg, 1973) indicated that managers typically begin their days with administration, becoming more interactive later on. Table III-4 presents the data from three time periods, two in the morning and one in the afternoon. The pattern is very clear: as the run progresses, time spent on paperwork and at one's own desk decreases and time in meetings increases. During the period from 1:30 p.m. to 2:29 p.m., time on paperwork, on the telephone, in meetings, at one's own desk, in the conference room, and with subordinates are all within the comparison range. Time with superiors and colleagues increases dramatically in this period.

We also believed that position in LGI would have an impact on activities. Higher level managers in field studies, for example, spend less time on paperwork and more time in meetings (McCall et al., 1978). Table III-5 shows the results for LGI managers at different levels and confirms the expected finding: Presidents and Vice-Presidents in LGI spent less time on paperwork and at their desks and more time in meetings.

Table III-5 also shows the activity profiles for LGI Vice-Presidents and Directors of Manufacturing. These roles are the most complete in the simulation because all superiors to and subordinates of these roles are present during a run. As is clear from the table, managers in these positions are solidly within the comparison range for time spent on paperwork, on the telephone, in meetings, and with subordinates. They spend more time than the comparison group at their desks, at the desks of others, with superiors, and with colleagues.

Table III-6 shows the activity patterns for the three divisions of LGI. Burns (1957) and Kurke and Aldrich (1979) suggest that managers in organizations that face fast-changing environments spend more time talking with each other than do managers in stable environments. We would expect that APD, the unstable division, would show less time on paperwork and more time in meetings. The table shows a slight tendency for this to be true when APD is compared to

CGD, and a marked difference compared to IGD. IGD, which operates bureaucratically on many dimensions (see McCall et al., 1979), showed quite different time profiles than did the other divisions.

Discussion

The data on managerial time allocations in LGI lend support to the validity of LGI as a stimulus for generating managerial behavior similar to that measured by diary and observational studies done in the field. In general, the data on time allocations were closest to the comparison range:

1. for experienced, upper-level managers
2. for managers in upper-level LGI positions or in positions where both superiors and subordinates are present in "live" roles
3. for managers in CGD and APD
4. after the first hour of the simulation run and increasingly as the day wore on.

These results are encouraging because LGI was designed as a simulation of upper-level management work, and managers from upper levels in their real organizations and those in upper-level LGI positions were the most similar in behavior to the results of field studies.

Some features of the simulation also seem to affect activity patterns. As managers spend more time in LGI, their behavior becomes more like the behavior of managers in the field. Because there is no way to make managers feel completely at home in a simulated organization that exists for only a day, it is gratifying to see how quickly the behavior becomes more typical.

It is also good to see that those LGI positions that are most complete produced the most typical behavior. Obviously all positions cannot have all superiors and subordinates present if the simulation is to remain a manageable size. While the less complete positions deviated some from the expected, the deviations were not severe. The comparison studies did not specify whether the managers had all their people on-site during data collection, so we cannot compare their results with ours on this dimension. It seems logical,

however, that managers with geographically removed subordinates would have slightly different activity patterns.

At the present time we do not know why managers in IGD were so different from those in CGD and APD. It could be a validity problem, but we believe that the nature of the division and not artifact is a better explanation. Unlike APD and CGD, IGD is schizoid: it produces some products that face volatile environments and others facing intermediate or stable environments. This may create a different kind of management challenge that is reflected in the behavior patterns of its managers. Future research will be aimed at understanding more fully the forces at work in this division.

For a few categories of activities there were consistent differences from the comparison range. Time at one's own desk and time with superiors were higher than is typical for managers on the job. Finding LGI managers at their desks 10 to 20% more than expected was probably a function of the physical site (there are few other places to go) and limiting the simulation to the same "day at the office" (the comparison studies covered several days or weeks and included movement to other sites). Spending about 10% too much time with superiors may have resulted from the limited number of "live" roles and from the presence of the Plant Managers on their "bi-montnly visit" (which creates a strong demand characteristic for these people to meet with their bosses that day).

Time with colleagues was higher and time with fellow specialists generally lower than expected. Again the nature of the live roles in LGI probably accounts for this, but the comparison with field studies is suspect since only one study reported the data in the same way we did. If we combine percent of time spent with colleagues and fellow specialists (for LGI as a whole) we would get 28.3% for LGI versus 20% for Stewart's (1967) study. We have no way of knowing how many colleagues and fellows were available to the managers in Stewart's study.

Mail and Phone Records

In addition to observable behavior, LGI creates traces of activities. Data relevant to content validity can be obtained unobtrusively by counting memos and phone calls. While we could find few studies reporting similar data from field settings, these activities are clearly part of managerial work and relevant to the domain of LGI.

Procedures

Managers in Looking Glass can send memos to each other or to anyone else in the company or outside. Each manager is provided with pressure-sensitive memo paper and mail is picked up and delivered four times during a simulation run. After each run, all memos were collected and sorted by position for tabulation.

Each manager in LGI also has a telephone. The systems used in these runs permitted a manager to call any other manager directly or, through a switchboard, to contact anyone else in the company or outside. All calls through the switchboard were logged.

Analysis of the mail record was designed for comparison with data reported by Mintzberg (1973). We first looked at the in-baskets that managers get at the start of LGI. We did not use Mintzberg's mail counts when designing the in-baskets, so it is fair to compare our inputs to what Mintzberg says managers face.

Next we looked at the number of memos managers in LGI sent and compared that with Mintzberg's output record. Because LGI is only 6 hours long, we extrapolated our figures to an 8-hour day comparable to Mintzberg's.

Finally we examined the input/output ratio of LGI managers and compared that with Mintzberg's findings. In all cases we counted only original memos written by LGI managers--copies were not included in the totals.

Analysis of the phone record was less direct because we could only record calls through the switchboard and not calls managers made to each other. Mintzberg (1973) and Kurke and Aldrich (1979) reported averages based on all calls, so we had to estimate LGI totals from pretest data.

Results

Mail inputs to LGI managers at the start of the simulation are reported in Table III-7. While the average manager has about 45 items to process, 5 of these are redundant with information given during the introduction, and another 7.8 are copies of mail sent by the manager "yesterday." For purposes of comparison with Mintzberg, we are interested only in the 32.2 items the average manager receives in "today's mail."

Table III-8 shows mail outputs at the end of LGI. The average manager wrote 7.7 memos in a 6-hour period, ranging across runs from 5.4 to 11.0. For purposes of comparison with Mintzberg's data, we extrapolated the number of memos to an 8-hour day. This increased the per-manager output to 9.6.

Overall LGI inputs and outputs, adjusted accordingly, are compared in Table III-9 with similar data from Mintzberg's study. LGI managers received 5.8 items more than Mintzberg's executives and the range was slightly higher. Given that we had to provide LGI managers with a lot of information about the company in addition to the regular daily mail, and that LGI managers had no secretaries to screen their mail, the results were gratifyingly close to Mintzberg's.

LGI managers wrote an average of 9.6 memos, compared with Mintzberg's 9.2, and the range was almost identical to Mintzberg's. This makes the input/output ratio for LGI managers .30 versus .35 in the comparison study. The range was completely within Mintzberg's limits.

The telephone record appears in Table III-10 and shows that an average LGI manager placed 3.61 calls through the switchboard. Using pretest data generated when all calls, including those to other live roles, were logged, we estimated the total number of calls per 8-hour day (see formula at the bottom of the table). While this estimate is at best crude, it can be compared with results from other studies. The comparison appears in Table III-11, and shows that the estimated average number of calls in LGI falls between Mintzberg's 5.3 and Kurke and Aldrich's 10.0 results.

Discussion

Mail output, mail input to output ratio, and estimated calls per person for LGI closely match results from field studies. Managers in LGI use mail and phone much as their counterparts in real life. This is true for the number of letters sent, number of calls made, and the percentage of time spent on the phone (see Table III-2). Without secretarial support, the amount of time on paperwork is slightly higher at some levels in LGI.

How Close to Reality?

Activity patterns are only one facet of the reality of managing in a complex system. They are, however, directly observable and a central feature of managerial jobs. The data presented in this section support the content validity of Looking Glass in terms of its ability to produce managerial behavior patterns similar to those found by field studies.

With respect to time allocations, simulation limits, population characteristics, and role in LGI did affect the profiles. It is our judgment that differences caused by such factors are well within tolerable limits--after all, managers' days vary considerably in their mix of activities. Research questions requiring activity profiles closest to those reported by field studies should sample after the first hour of the run (1 hour and 45 minutes, counting the in-basket period), because activity patterns came closer to field results as the simulation went on (Table III-4).

The time sampling method we chose did not permit us to examine the brevity, variety, and fragmentation of the LGI manager's day. These are, of course, critical features of managerial work (McCall et al., 1978) and need to be looked at as an additional validity check on LGI. Further research is also needed on IGD: while the activity patterns observed were somewhat different than the comparison results and the other dimensions, mail and phone records were not.

In summary, the evidence thus far supports the content validity of Looking Glass as a simulation of managerial work. The developmental procedures (reported in Section II) assured that the problems and issues faced by LGI managers reflected those faced by practicing managers in similar positions in real organizations. The activities produced by these stimuli compare favorably with those reported in diary and observational studies of managers in ongoing organizations.

OBSERVER FORM FOR TIME SAMPLING

TITLE_____ DIVISION_____ OBSERVER_____ START_____ STOP_____

EPISODE	DURATION	WHAT									WHERE						WITH WHOM																					INITIATOR						TOPIC(S)
																				APD					IGD				CGD															
		PAPERWORK	TELEPHONE	SCHEDULED MEETING	UNSCHEDULED MEETING	UNKNOWN MEETING	WALKING	WAITING	OTHER		OWN DESK	OTHER'S DESK	CONFERENCE ROOM	HALLWAY	OTHER		PRES	VP	DIR-MFG	DIR-S&M	DIR-PD	PM-OF	PM-IC	PM-CAP	VP	DIR-MFG	DIR-S&M	DIR-PD	PM-AUTO	PM-SPEC	VP	DIR-MFG	DIR-S&M	DIR-PD	PM-FLAT	PM-LIGHT	OUTSIDER	UNKNOWN	ALONE		SELF	SUPERIOR	PEER	SUBORDINATE	OTHER	UNKNOWN	
1																																										
2																																										
3																																										
4																																										
5																																										
6																																										
7																																										
8																																										
9																																										
10																																										
11																																										
12																																										

Figure III-1

STUDIES USED FOR COMPARISON

Author(s)	Method	N	Levels	Organization(s)
Copeman (1963)	Diary	29	Managing Directors & Chief Executives	Unknown
Brewer & Tomlinson (1963-1964)	Diary	6	Mid-Level	6 Firms
Hinrichs (1964)	Diary	232	Nonsupervisory to Middle Management[1]	1 Company
Horne & Lupton (1965)	Diary	66	Middle Managers	10 Organizations
Stewart (1967)	Diary	160	Middle and Senior Managers	Over 17 Industries
Choran (1969)	Observation	3	Presidents	3 Organizations
Mintzberg (1973)	Observation	5	Chief Executives	5 Organizations
Cohen & March (1974)	Diary	42	College Presidents	42 Colleges
Kurke & Aldrich (1979)	Observation	4	Chief Executives	4 Organizations

[1]Only data from managers were used for comparison.

Figure III-2

Table III-1
Results of Studies Used for Comparison with LGI
(Converted to Percent of Total Time)[1]

Activity	Copeman (1963)	Brewer & Tomlinson (1963-64)	Hinrichs (1964)	Horne & Lupton (1965)	Stewart (1967)	Choran (1969)	Mintzberg (1973)	Cohen & March (1974)	Kurke & Aldrich (1979)	Comparison Range
What?										
Paperwork	40	32	25	26	36	35	22	-	25	22-40
Telephone	5	6	8	9	6	17	6	-	8	5-17
Meetings	41	51	48	54	44	36	69	-	63	36-69
Other	5	-	19	2	10	12	3	-	4	2-19
Where?										
Own Desk	-	-	-	52	51	-	52	35	57	35-57
Other's Desk	-	-	-			-	6	26	3	3-26
Conference Room	-	-	-	48	46	-	11	-	25	11-25
Other	-	-	-			-	30	38	5	5-38
With Whom?										
Subordinates	-	-	-	-	26	36	37	29	37	26-37
Superior	-	-	-	-	8	-	5	6	13	5-13
Colleagues	-	-	-	-	12	-	-	-	-	12
Fellow Specialists	-	-	-	-	8	-	-	-	-	8

[1]Rounded to nearest whole number. Dashes indicate that the study did not report data in the category or that they could not be converted to percent of total time.

Table III-2
Time Spent by Looking Glass Managers
On Various Activities[1]

Activity	Total Minutes Observed	Average Percent Of Time Spent Per Run	Standard Deviation Across Runs	LGI Range (Percent)[2]	Comparison Range (Percent)[3]
What?					
Paperwork	2094.2	46.3	5.3	38-53	22-40
Telephone	453.3	10.1	3.8	5-17	5-17
Meetings	1839.4	40.5	6.6	29-53	36-69
Other	141.2	3.1	0.8	2- 4	2-19
Where?					
Own Office	2984.4	68.2	6.9	58-77	35-57
Other's Office	846.5	19.4	6.9	7-28	3-26
Conference Room	439.5	10.0	10.0	0-32	11-25
Other	107.4	2.4	1.1	1- 4	5-38
With Whom?[4]					
Subordinates[5]	541.7	34.1	8.4	20-47	26-37
Superiors	1052.9	24.2	5.5	18-36	5-13
Colleagues[6]	1097.0	25.3	7.5	16-40	12
Fellow Specialists[7]	111.1	3.0	1.8	0- 6	8

[1]Based on 10 runs of LGI.

[2]Rounded to nearest whole number.

[3]Range of means from diary or observational studies listed in Table III-1.

[4]"With Whom" percentages exceed 100% because a participant could meet with more than one person at once.

[5]Only managers with "live" subordinates were counted.

[6]Managers reporting to the same boss.

[7]Managers performing the same function but in different divisions.

Table III-3
Activity Patterns in LGI for Managers with Different Background Characteristics
(As a Percent of Total Time)

Activity	Higher-Level Managers[1]	Lower-Level Managers[2]	Line[3]	Staff[4]	Experienced[5]	Less Experienced[6]	Comparison Range[7]
What?							
Paperwork	40.1	49.1	52.9	49.8	44.8	47.5	22-40
Telephone	9.1	10.7	8.1	9.1	8.6	10.9	5-17
Meetings	47.2	37.4	36.7	38.3	43.2	39.3	36-69
Other	3.7	2.8	2.3	2.8	3.4	2.3	2-19
Where?							
Own Desk	67.9	70.0	71.7	70.7	66.0	72.0	35-57
Other's Desk	19.9	18.7	21.2	20.7	20.2	19.0	3-26
Conference Room	9.1	9.6	5.7	6.4	11.7	6.6	11-25
Other	3.0	2.0	1.3	2.2	2.2	2.4	5-38
With Whom?							
Subordinates[8]	35.9	32.4	23.8	25.2	35.1	34.2	26-37
Superiors	21.2	24.7	22.9	23.5	26.6	23.9	5-13
Colleagues[9]	21.9	25.8	23.9	24.1	27.1	22.0	12
Fellow Specialists[10]	1.9	2.6	2.8	3.0	4.0	0.6	8

[1]Managers who classified their real jobs as upper or upper-middle management. Based on 1180 to 1220 minutes of observation.
[2]Managers who classified their real jobs as lower or lower-middle management. Based on 2853 to 2950 minutes of observation.
[3]Managers in engineering, manufacturing, or sales. Based on 843 to 889 minutes of observation.
[4]Managers in labor or public relations, personnel, or R&D. Based on 1711 to 1780 minutes of observation.
[5]Managers with 4 or more years of managerial experience. Based on 2207 to 2302 minutes of observation.
[6]Managers with fewer than 4 years of managerial experience. Based on 1449 to 1498 minutes of observation.
[7]From Table III-1.
[8]Only managers with "live" subordinates were counted.
[9]Managers reporting to the same boss.
[10]Managers performing the same function but in different divisions.

Table III-4
Activity Patterns during Different Time Periods[1]
(As a Percent of Total Time)

Activity	From 9:30 to 10:29[2]	From 10:30 to 11:29[3]	From 1:30 to 2:29[4]	Comparison Range[5]
What?				
Paperwork	54.9	38.7	35.3	22-40
Telephone	11.9	12.7	6.7	5-17
Meetings	31.3	45.5	53.5	36-69
Other	1.9	3.1	4.5	2-19
Where?				
Own Desk	79.0	65.2	54.8	35-57
Other's Desk	9.0	19.1	27.4	3-26
Conference Room	9.9	13.9	14.4	11-25
Other	2.1	1.8	3.4	5-38
With Whom?				
Subordinates[6]	32.0	43.0	27.6	26-37
Superiors	16.8	24.3	39.2	5-13
Colleagues[7]	16.6	24.0	44.0	12
Fellow Specialists[8]	3.6	3.6	1.8	8

[1]Observation periods were chosen to yield maximum number of observations given a range of starting and lunch times across runs. Runs typically began at 8:30 or 9:00.
[2]Based on 927-928 minutes of observation.
[3]Based on 899-937 minutes of observation.
[4]Based on 1016-1074 minutes of observation.
[5]From Table III-1.
[6]Only managers with "live" subordinates were counted.
[7]Managers reporting to the same boss.
[8]Managers performing the same function but in different divisions.

Table III-5
Activity Patterns for Different LGI Positions
(As Percent of Total Time)

Activity	Percent of Time Spent by: Level 1[1]	Level 2[2]	Level 3[3]	Vice-Presidents And Directors of Manufacturing[4]	Comparison Range[5]
What?					
Paperwork	34.8	44.1	55.5	31.5	22-40
Telephone	5.9	11.9	10.1	9.7	5-17
Meetings	55.5	40.7	32.1	56.3	36-69
Other	3.9	3.4	2.4	2.5	2-19
Where?					
Own Office	62.2	68.8	70.8	61.0	35-57
Other's Office	26.4	16.5	18.9	26.9	3-26
Conference Room	6.9	12.2	9.1	9.5	11-25
Other	4.5	2.5	1.3	2.6	5-38
With Whom?					
Subordinates[6]	31.7	36.7	-	31.7	26-37
Superiors	32.7	21.9	23.9	28.6	5-13
Colleagues[7]	24.7	29.5	20.6	27.2	12
Fellow Specialists[8]	-	2.1	4.3	0.7	8

[1]Forty Presidents and Vice-Presidents of LGI. Based on 885-925 minutes of observation.
[2]Ninety Directors of LGI. Based on 1916-1995 minutes of observation.
[3]Seventy Plant Managers of LGI. Based on 1574-1607 minutes of observation.
[4]Sixty Vice-Presidents and Directors of Manufacturing. Based on 1313-1371 minutes of observation.
[5]From Table III-1.
[6]Only managers with "live" subordinates were counted.
[7]Managers reporting to the same boss.
[8]Managers performing the same function but in different divisions.

Table III-6
Activity Patterns for Different LGI Divisions
(As a Percent of Total Time)

Activity	Division[1] APD	CGD	IGD	Comparison Range[2]
What?				
Paperwork	41.4	42.5	56.0	22-40
Telephone	10.0	11.5	9.9	5-17
Meetings	45.6	41.9	32.5	36-69
Other	3.1	4.2	1.7	2-19
Where?				
Own Office	61.1	66.8	75.2	35-57
Other's Office	24.1	20.1	15.4	3-26
Conference Room	13.1	9.9	7.4	11-25
Other	1.8	3.2	2.0	5-38
With Whom?				
Subordinates[3]	33.8	32.2	29.2	26-37
Superiors	32.5	22.9	15.8	5-13
Colleagues[4]	30.9	29.1	14.9	12
Fellow Specialists[5]	3.2	3.9	2.1	8

[1]In each run APD has seven members, IGD and CGD, six. Based on 10 runs with a minimum of 400 minutes of observation per run.

[2]From Table III-1.

[3]Only managers with "live" subordinates were counted.

[4]Managers reporting to the same boss.

[5]Managers performing the same function but in different divisions.

Table III-7
Mail Inputs at the Start of LGI

	President	Average for Managers in: APD	IGD	CGD	Average for Managers in LGI	Range
Actual Number of Pieces Received in "Today's" Mail[1]	33	39.4	37.3	35.0	37.2	28-50
Today's Mail, Adjusted for Redundant Pieces[2]	28	34.4	32.3	30.0	32.2	23-45
Copies of Mail Sent "Yesterday"[3]	19	8.9	6.7	5.7	7.8	1-20
Total to be Processed[4]	47	43.3	39.0	35.7	39.9	27-61

[1]Number of items in the in-basket at the start of the simulation that are addressed to or copied to a position.

[2]The in-baskets contain approximately five items that participants received the night before during the introduction. These are repeated because participants sometimes forget to bring them back. They do not represent new information and should not be counted.

[3]These are copies of memos that participants "sent" to someone else before the simulation started. They are part of the simulation materials, not items actually written by participants.

[4]Does not count redundant pieces.

Table III-8
Mail Outputs at the End of LGI

	President	Average for Managers in: APD	IGD	CGD	Average: Manager In LGI
Average Number Of Memos Written Per Person Per Run (6 Hours)[1]	9.5	7.5	7.3	8.0	7.7
Range Of Averages[2]	6-21	4.0-12.4	4.2-12.5	4.7-11.2	5.4-11.0
Average Number of Memos Written, Extrapolated to 8 Hours[3]	11.9	9.4	9.1	10.0	9.6
Extrapolated Range[3]	7.5-26.3	5.0-15.5	4.3-15.7	5.9-14.0	6.8-13.8

[1]Based on actual count of memos written in 10 runs. Does not include copies.

[2]Based on range of averages for each of 10 runs.

[3]Linear production was assumed.

Table III-9
Comparison of LGI Mail Records
With Mintzberg (1973)

	Managers in LGI		Managers in Mintzberg	
	Mean	Range	Mean	Range
Pieces Received in "Today's" Mail[1]	32.2	23-45	26.4	13.8-34.4
Number of Memos Sent (8 hours)[2]	9.6	6.8-13.8	9.2	4.6-13.2
Input/Output Ratio	.30	.21-.43	.35	.16-.62

[1]Today's mail adjusted for redundant pieces (see Table III-7).

[2]Memos sent extrapolated to 8 hours (see Table III-8).

Table III-10
Telephone Records from LGI

	Managers in LGI	
	Mean	Range
Calls to "Non-Live" Roles (6 Hours)[1]	3.61	2.20- 5.30
Extrapolated Calls to "Non-Live" Roles (8 Hours)[2]	4.51	2.75- 6.63
Estimated Total Calls, Extrapolated to 8 Hours[3]	7.94	6.18-10.05

[1]Based on records of all calls to people not in the 20 LGI live positions. Automatic switching among live roles did not permit counts of internal calls. Based on 9 runs.

[2]Linear extrapolation.

[3]Estimate is based on a combination of pretest and standardized data and is tenuous. It was calculated as follows: Average number of calls per manager in 3 pretest runs (before automatic switching) was 4.4. The average time spent on the phone (from time sample in one pretest run) was 7%. The average time spent on the phone in the 10 standardized runs was 10.1%.

$$\frac{\text{number of calls}}{.101} = \frac{4.4}{.07} = 6.35$$

Extrapolated to eight hours, this is 7.94.
Range estimates were derived by getting the difference between calls to non-live roles (3.61) and estimated total calls (6.35). This difference (2.74) was added to the range for non-live calls and extrapolated to 8 hours.

Table III-11
LGI Telephone Records Compared to
Mintzberg (1973) and Kurke and Aldrich (1979)

	LGI[1]		Mintzberg		Kurke & Aldrich	
	Mean	Range	Mean	Range	Mean	Range
Telephone Calls	7.94	6.18-10.05	5.3	4.4-6.0	10.0	Not Reported

[1]Estimates from Table III-10.

IV. BEYOND CONTENT VALIDITY

Sections II and III of this report dealt with the content validity of the Looking Glass simulation. This section examines construct- and criterion-related validity issues by 1) providing an example of one construct-validity study using LGI data, 2) outlining some other constructs that could be measured in LGI, and 3) describing a criterion-related validity study soon to begin.

The American Psychological Association defines a construct as a "work of informed, scientific imagination; that is, it is a theoretical idea developed to explain and to organize some aspects of existing knowledge" (APA, 1974, p. 29). Because Looking Glass was designed to simulate managerial behavior in a realistic organizational setting, many of the constructs of organizational behavior should apply. For example, a popular construct in organization theory is the notion of fit between an organization and its environment. Effective organizations in one kind of environment should differ on certain characteristics from less effective organizations in the same environment and from effective organizations in different kinds of environments.

The first part of this section will look at Looking Glass in terms of this and some other constructs. Even though LGI was designed primarily to generate new research questions, it should produce results similar to those found in field studies of major constructs. That is, if LGI is valid, it can be anchored in established findings reported in the literature.

Unfortunately, the existing data base for LGI is small: although 200 managers have gone through it, there are only 10 standardized runs. For many of the constructs of interest, the appropriate unit of analysis is the run, not the individual. This means, of course, that enormous differences would be required to produce statistically significant results.

Because of the small sample sizes and because the reliabilities of many measures used with LGI have not yet been established, we will restrict our discussion of construct validity to one specific example and a discussion of two other contructs we are planning to test.

Construct Validity: An Example

One major thrust in organizational theory is that effective organizations fit with the environment they face. Explication of this approach and supportive data have appeared in many places (see, for example, Lawrence & Lorsch, 1967; Lorsch & Morse, 1974; Burns & Stalker, 1961). Contingency theory of organizations is a good example of what Nunnally (1967) described as an abstract construct. There seems to be a set of general parameters on which there is some agreement, but specific elements and measures vary widely. It is, nonetheless, the kind of construct that LGI was designed to tackle and we would expect the different divisions of LGI to react differently to the environments they face.

The construct: Organization-environment fit. To generate some basic propositions for LGI, we can draw on two different kinds of studies. One set of studies deals with degree of environmental uncertainty and organizational characteristics that should correspond to it. The other set looks at managerial activity patterns as a function of environmental characteristics.

The basic paradigm of the former set of studies is that effective organizations have characteristics appropriate to the environment in which they operate, and that different environments dictate different characteristics. There are, of course, many problems associated with this paradigm, as is reflected by the following review statement:

> The literature on the structural-contingency theory shows a good deal of conceptual confusion. The measurement instruments vary, so that many of the studies are not comparable. It is often not clear what is meant by environment and which of its variables have explanatory power for structural differences among organizations. Furthermore, it seems that some authors equate dimensions of environment with dimensions of technology. (Pennings, 1975, p. 393)

It is not our purpose to pursue the controversy, but rather to acknowledge it and then find a few general propositions that might be tested in LGI. These are presented in summary form in Figure IV-1. Essentially, the construct is that effective organizations in uncertain environments are less formally structured, less pyramidal, and more decentralized, while effective organizations in more certain environments are more formal, hierarchical, and centralized. The ineffective organizations in one kind of environment resemble effective organizations in the other kind of environment.

Environmental uncertainty typically includes rate of change, predictability of change, hostility, and so on (see Section II of this report for a discussion of these characteristics).

A second set of studies suggests how these kinds of things might show up in LGI. Mintzberg (1973) and Kurke and Aldrich (1979) suggested that in more dynamic environments, managerial work will be more varied and fragmented and the manager's orientation will be more toward live action and oral communication. This suggests that the activity patterns in Looking Glass should reflect the characteristics outlined in Figure IV-1. In the volatile environment of APD we should find that effective divisions produce less formal activity patterns, with more lateral information flow, and more oral communication. Less effective APDs should be the opposite. Effective stable divisions, CGDs, should look more like the less effective APDs. These propositions are stated more formally in Figure IV-2.

We are suggesting that the percentage of time managers spend with subordinates, superiors, and colleagues is an indicator of lateral versus vertical information flow and of integration of departments; time spent on paperwork and number of memos written reflect formality of structure; and time in meetings and on the phone are indicators of information sharing and coordination through oral communication. Because each of the divisions is formally structured in the same way and because we do not force managerial activities in the simulation, support of the propositions is evidence of LGI's construct validity.

Method. Numerous performance measures were available from each of the 10 standardized runs of Looking Glass (see McCall et al., 1979). The best indicators of divisional performance are the number of good choices made on the key problems facing each division, adjusted for the number of boners. Classification of each possible choice for each problem into these good and poor categories was done by expert judges when the Decision-Making Questionnaires were initially designed. (See McCall et al., 1979, for a complete description of problems, items, coding procedures, and interrater agreement.) Two judges reviewed the Decision-Making Questionnaires for APD and CGD and processed the decisions according to the following weighted formula:

> [3 x number of choices having significant positive impact on total LGI performance + 2 x number of choices judged as very good + 1 x number of choices judged as acceptable] - [2 x number of choices judged very poor + 1 x number of choices judged poor].

This process resulted in a score for each division in each of the runs. The 10 APDs were then split at the median, resulting in 5 effective and 5 ineffective runs. CGD's scores were distributed bimodally, so the highest 4 were labelled effective, the lowest 6, ineffective. This created a 4-fold table with unequal cell sizes (see Figure IV-3).

The activity measures were gathered by direct observation and counting, as described in Section III of this report. Percent of time spent with superiors, subordinates, colleagues, and on meetings and paperwork was calculated for each division in each run. Memos written and phone calls made were counted.

Results. A two by two (performance x environment) analysis of variance design was used to test the hypotheses for each variable. As expected with such small cell sizes, only one interaction term was statistically significant at .05. The graphs are suggestive, however, and appear in Figures IV-4 through IV-10 (intercorrelations of the variables appear in Appendix B).

The first hypothesis was that the percentage of time managers spent with their colleagues would be higher in effective APDs and ineffective CGDs, and lower in ineffective APDs and effective CGDs. Figure IV-4 shows the results which, while not statistically significant, are clearly in the anticipated direction.

Hypothesis 2 suggested that time spent with bosses and subordinates (reflecting vertical chain of command) would be higher in effective CGDs and ineffective APDs, lower in ineffective CGDs and effective APDs. Figures IV-5 and IV-6 show the results graphically. The hypothesis tends to be supported for time with subordinates (IV-5), but not for time with bosses (IV-6). Managers in effective CGDs spent less time with their bosses than managers in ineffective CGDs, and managers in APD spent about the same amount of time with their bosses regardless of performance level.

Hypothesis 3 suggested that managers in effective APDs and ineffective CGDs would show less formality, and vice-versa, as indicated by percent of time on paperwork and number of memos written. Figure IV-7 confirms the hypothesis for time on paperwork (the interaction is significant, $p < .05$). Figure IV-8, however, is only partially supportive. Effective APDs did write fewer memos per manager than effective CGDs, but ineffective divisions were virtually indistinguishable and generated markedly more paper.

Hypothesis 4 stated that effective APDs and ineffective CGDs would spend more time in meetings and make more phone calls, while ineffective APDs and effective CGDs would spend less time meeting and make fewer calls. The graphs in Figures IV-9 and 10 show a tendency for this to be true, even though APD made more calls than CGD regardless of performance.

Discussion. These data are offered primarily as an example of how the construct validity of LGI can be approached. While the small n virtually precluded statistically significant results, the results reported here were, with two exceptions, clearly in the expected directions. This is particularly intriguing because Looking Glass runs only 6 hours and is producing effects that one might expect to take long periods of time to become observable.

There is a tendency for effective divisions of Looking Glass facing uncertain external environments, in contrast to effective divisions facing certain external environments, to 1) spend more time with colleagues, 2) spend less time with subordinates and more time with bosses, 3) spend less time on paperwork and more time in meetings, and 4) write fewer memos and place more calls. Similar contrasts emerge when effective divisions are compared to ineffective divisions facing the same environment.

As additional runs accumulate, it will be possible to take a more comprehensive look at contingency theories of organization-environment fit by generating a more comprehensive set of hypotheses and by using additional measures from LGI (such as power distributions, climate scores, and the tactical, strategic, and structuring scales from the DMQ).

As the analysis of variance results show, there was substantial, unaccounted for variance across runs. Future analyses will examine factors that are affecting this wide within-cell variation, including a closer look at specific group characteristics.

In concluding this example, we want to note the two-edged sword of construct validity in Looking Glass. Organizational behavior contains many constructs like structural contingencies and leadership style that are both abstract and replete with noncomparable measures and research results. LGI in many cases may reveal more about the constructs measured by it than the constructs reveal about LGI's validity. Particularly for macro-level constructs, LGI is amenable to more control and more precise measurement than a real organization. Its inductive development frees it from the narrowness of a particular theory, meaning that

conflicting approaches can actually be tested where "all things are equal." That is, each run of LGI starts with the same problems, issues, and structure unless these are deliberately changed by the researcher.

Some Other Constructs and LGI

Data are available and will be analyzed regarding at least two other constructs: the structural contingencies view of power and the information-processing view of decision making. Structural views of power (Hickson, Hinings, Lee, Schneck, & Pennings, 1971; Salancik & Pfeffer, 1977) suggest that power distributions in organizations are determined by structural rather than interpersonal factors. For example, a department might be powerful because of the problems it has to deal with, its control of valued resources, its centrality in the work flow, etc. After each run of Looking Glass, we have collected data on the relative power of the 3 divisions, 9 departments, and 20 positions, and on the importance of several sources of power (ranging from problems dealt with to personal forcefulness). In LGI the researcher knows exactly what problems exist, where information starts, the structural relationships in the organization, financial performance, and a host of relevant factors. Divisions, departments, and positions can be assessed vis-a-vis structural hypotheses, and power ratings examined. In addition, interventions that change the structural contingencies can be made, testing predictions of changing power distributions.

It is also possible to assess perceived versus actual power; the former by participants' rankings and the latter by calculating how resources were actually allocated during the simulation.

Work on information processing (e.g., Schroder, Driver, and Streufert, 1967) suggests a number of hypotheses about how individuals use information in making decisions. In LGI this is a critical feature as the managers sift through and gather information to make (or avoid) decisions. For each position in Looking Glass, the researcher knows what information was available at the start. At the end, data are available for each position on 1) what information was known at the close of the day, 2) what decisions were made, and 3) who was responsible for each decision. It is possible, then, to calculate information gain or loss (the monitor role suggested by Mintzberg, 1973) as it relates to specific decisions. It is also possible to examine the moderating

effects of a variety of variables, including the types of problems handled, environmental characteristics, hierarchical and functional location in the organization, and cognitive style (through pretest measures). Again, interventions can be made against specific predictions of changes in information processing or decision quality (for example, the initial distribution of information can be manipulated). Construct validity might be demonstrated, for example, by showing that increased information on a problem increases confidence in the decision but not quality (Slovic, 1972).

The list of constructs that could be looked at in LGI could go on (e.g., leadership style or participation in decision making), and each analysis is both a test of the simulation and a chance to learn something about the construct in question. We hope that other researchers will use the new tool to pursue this learning. Whether LGI or the construct is the subject of scrutiny, we stand to improve our understanding of organizational behavior and the tools and constructs that comprise it.

Criterion-Related Validity

As mentioned earlier, Looking Glass is now in transition from the developmental to the application stage. Using it as a research tool depends upon organizations seeing enough practical value in it to send large numbers of managers through it. The training value of a valid simulation of management in a complex system is obvious and there is, of course, pressure to use it for assessment/selection purposes.

LGI was not designed as a formal assessment device for corporate use, nor has it been validated for such purposes. It lacks many of the desirable features of traditional assessment centers because the managerial roles are different and unequal in demands (as they would be in a real organization). In some ways, however, LGI may be a more realistic managerial assessment device than an assessment center precisely because it preserves organizational role differences.

We are now in the beginning phases of a major study to assess the ability of LGI to predict management success. We are trying to model the research paradigm generated by assessment center validation (e.g., MacKinnon, 1975), including banking of data over several years. The stages we are planning are roughly as follows:

1. Job analysis of upper-level management jobs in the target organization to determine important behavioral dimensions, critical incidents, and work characteristics.

2. Analysis of each position in LGI to determine what dimensions can be measured and which events or problems for each position might generate the behavior. Thus, each position would be assessed in terms of its unique properties.

3. Development of observation content, of procedures for recording behavior during the simulation, and training for assessors.

4. Development of procedures for converting assessor observations into individual predictions of managerial success.

5. Identification of criterion measures of managerial success for the organization and procedures for collecting and storing both these data and the assessment ratings outside the client system.

The design calls for assessing 160 to 200 managers per year for the next 3 years and doing both concurrent and predictive validity analyses. Criterion measures would include, but not be limited to, promotion rate, appraisal rating, and salary growth.

This study has at least two important outcomes. First, the concurrent analysis will show whether or not performance in Looking Glass is highly related to current performance on the job. Second, the predictive analysis will show the degree to which LGI can predict managerial success several years later. Until these types of data are available, LGI cannot be used ethically for formal assessment of managers.

Beyond Validity

Obviously, assessing the validity of a tool as complex as Looking Glass could consume a research lifetime. As important as such research is, we hope that obsession with it will not obscure the reasons LGI was developed. We built it because we thought such a vehicle was needed to generate new ideas about leadership in complex systems. We built it inductively to minimize the chances that the theoretical blinders of previous research would prevent us from seeing

new things. We built in the complexity of a real organization to permit observation of both the macro (environmental and structural) and micro (group and individual) forces that impact on leader behavior. We chose simulation because it preserves large hunks of reality while making control and experimental manipulations possible.

Some of the questions we would like to ask, and would like to encourage others to ask, are:

1. In understanding leader behavior, are peer, subordinate, and self-perceptions of reality more useful than objective measures of behavior and impact?

2. To what extent is leader behavior determined by variables like organizational design, environmental characteristics, or the nature of the problems to be tackled?

3. Will the rational (manager as rational planner) or the frenetic (manager as juggler) view of managerial work (McCall, 1979) provide better understanding of what managers are doing?

4. Can some of the more novel views of organizational behavior--loosely coupled systems (Weick, 1979), organizations as garbage cans (Cohen, March, & Olsen, 1972)--be made operational and, if so, can they improve our theorizing?

5. How much of the variance in organizational effectiveness can be accounted for by the individual, the group, or the organization?

6. To what extent are we getting into trouble by aggregating individual data to group and organizational levels?

7. Which approach to power--structural or individual--is most helpful in understanding leadership behavior in hierarchical systems?

8. How useful can simulations be for generating new ideas that can be tested in the field, or for testing causality suggested by correlational field studies?

9. Can management training and management research develop a symbiotic relationship, thus permitting use of simulation for both purposes?

We think these are important questions. We think Looking Glass can make a substantial contribution to answering them.

Completing the Circle

Obviously we have invested a considerable part of our professional lives in the development of Looking Glass and will invest still more in pursuing its research applications. Dissonance theory alone would predict that we will extoll its virtues, perhaps noticing more of its successes than of its shortcomings. Frankly, we are proud of what we have accomplished so far, and grateful to the Office of Naval Research and the Center for Creative Leadership for making it possible for us to do it. But as we noted in the start of this report, the development of LGI is only the beginning: its value rests in what we and others do with it now that we have it. The data from future research will have to speak for themselves.

During the last 3 years we have worked with over 400 managers as part of developing and running Looking Glass. They ranged from presidents of major corporations to newly promoted first-line supervisors. As the project progressed and became more complicated, we even became managers ourselves. Between what they shared with us and our first-hand experience, we could never forget why we started the project. We did it because these managers and their thousands of contemporaries have been given short shrift. We still know so little about the demands of the job or what it takes to do it effectively. As Sayles (1979) has put it:

> Each day does not bring clear cut victories and problem solving but hours of painful persuasion, listening, and accomodation.
>
> This peripatetic flurry, the quantity of movement and activity, is not, as many naive managers assume, the result of poorly planned days, disorganization, or difficult personalities. There is no "over-the-rainbow," placid, sedate, harmonious world for the winning executive. Management is and has to be an action, an interactive role, both more difficult and more demanding--not to mention more frustrating--than the dispassionate management scientists seek and describe. (p. 13)

We owe the managers one: it's time to tell it like it is.

SOME GENERAL PROPOSITIONS ON ORGANIZATION-ENVIRONMENT FIT

Effective Organizations In Uncertain Environments	Effective Organizations In Certain Environments
Low Formal Structure	High Formal Structure
Coordination through Structure is Low	Coordination through Structure is High
Influence Diffused	Influence Concentrated

(Lorsch & Morse, 1974)

Organic--Interaction Runs Laterally as much as Vertically	Mechanistic--Interaction Tends to be Vertical

(Burns & Stalker, 1961)

Integration High	Integration Lower
More Knowledge at Lower Levels	Less Knowledge at Lower Levels

(Lawrence & Lorsch, 1967)

Figure IV-1

CONTINGENCY PROPOSITIONS FOR LGI

Environmental Uncertainty	Performance Level: High	Performance Level: Low
High (APD)	1. Lateral Interaction High 2. Interaction with Boss, Subordinates Lower 3. Less Time on Paperwork, Fewer Memos Written 4. More Time in Meetings, More Phone Calls Placed	1. Lateral Interaction Low 2. Interaction with Boss, Subordinates Higher 3. More Time on Paperwork, More Memos Written 4. Less Time in Meetings, Fewer Phone Calls Placed
Low (CGD)	1. Lateral Interaction Low 2. Interaction with Boss, Subordinates Higher 3. More Time on Paperwork, More Memos Written 4. Less Time in Meetings, Fewer Phone Calls Placed	1. Lateral Interaction High 2. Interaction with Boss, Subordinates Lower 3. Less Time on Paperwork, Fewer Memos Written 4. More Time in Meetings, More Phone Calls Placed

Figure IV-2

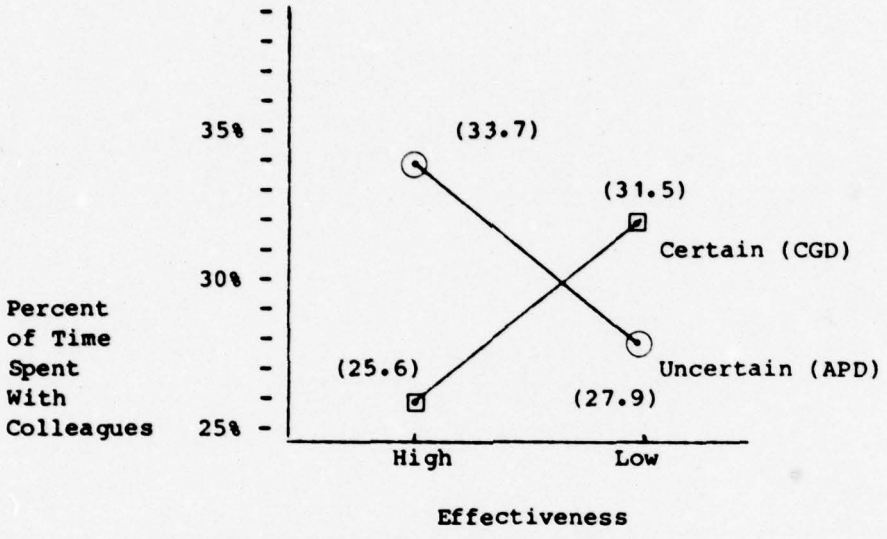
BASIC ANOVA DESIGN

Environmental Uncertainty	Effectiveness: High	Effectiveness: Low
High (APD)	$\underline{n}$ = 5 (17, 14, 12, 11, 10)[1]	$\underline{n}$ = 5 (9, 9, 7, 5, 3)
Low (CGD)	$\underline{n}$ = 4 (12, 11, 11, 9)	$\underline{n}$ = 6 (6, 6, 5, 3, 2, 0)

[1]Effectiveness scores of the divisions included in each cell.

Figure IV-3

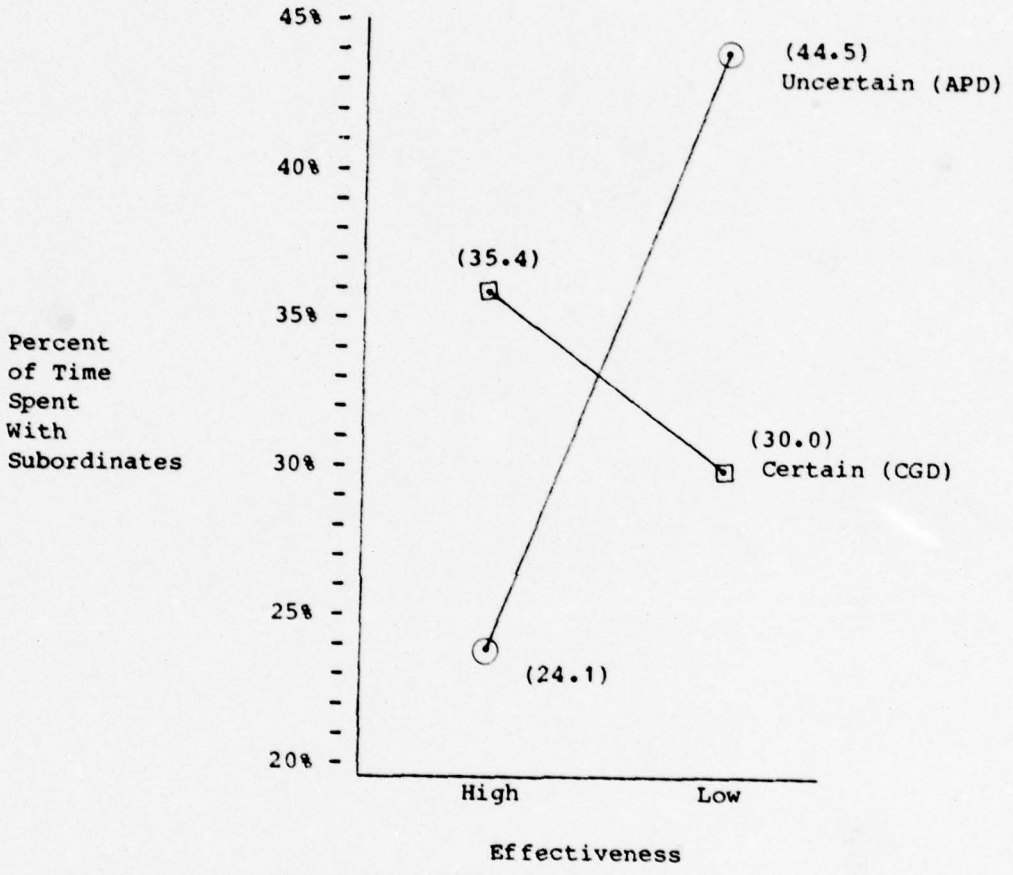
PERCENT OF TIME SPENT WITH COLLEAGUES



Source	SS	df	MS	F	p
Performance (A)	0.73	1	0.73	< 1.00	.94
Division (B)	14.03	1	14.03	< 1.00	.75
A x B	169.17	1	169.17	1.26	.28
Residual	2151.85	16	134.49		

Figure IV-4

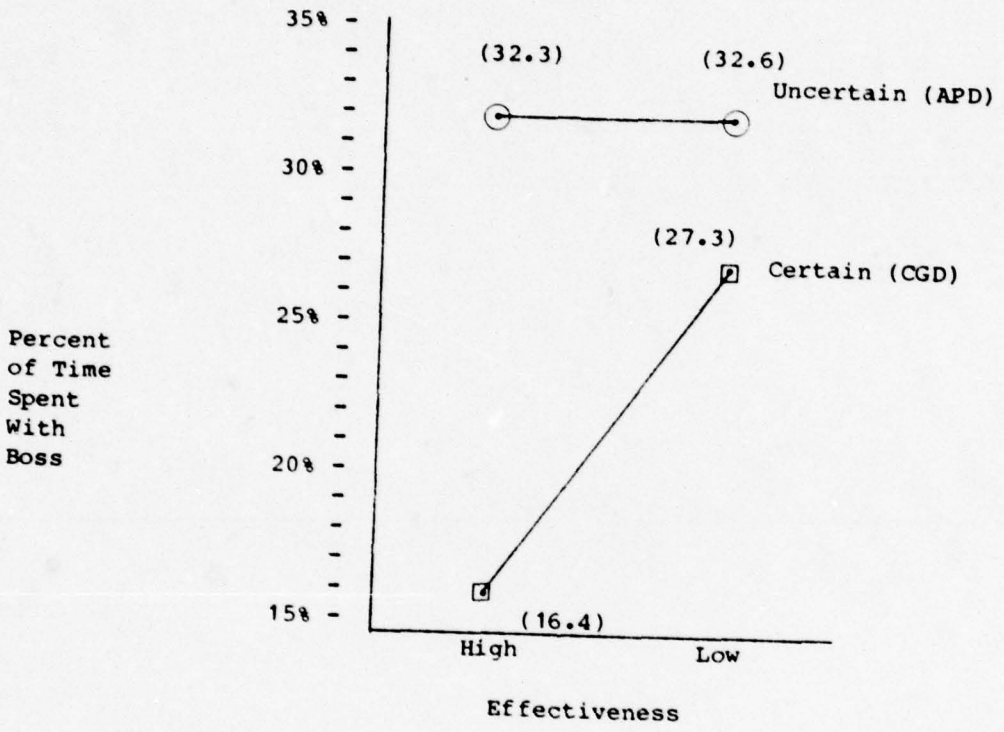
PERCENT OF TIME BOSSES SPENT WITH THEIR SUBORDINATES



Source	SS	df	MS	F	p
Performance (A)	358.06	1	385.06	< 1.00	.43
Division (B)	52.49	1	52.49	< 1.00	.77
A x B	956.73	1	956.73	1.62	.22
Residual	9433.57	16	589.60		

Figure IV-5

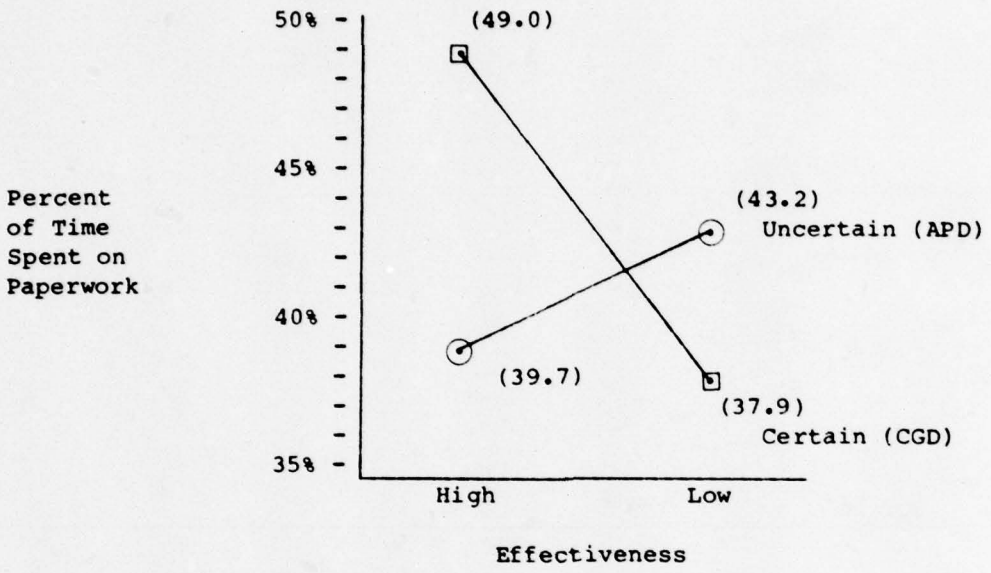
PERCENT OF TIME SUBORDINATES SPENT WITH THEIR BOSSES



Source	SS	df	MS	F	p
Performance (A)	426.44	1	426.44	2.08	.17
Division (B)	167.70	1	167.70	< 1.00	.38
A x B	414.64	1	414.64	2.02	.18
Residual	3286.75	16	205.42		

Figure IV-6

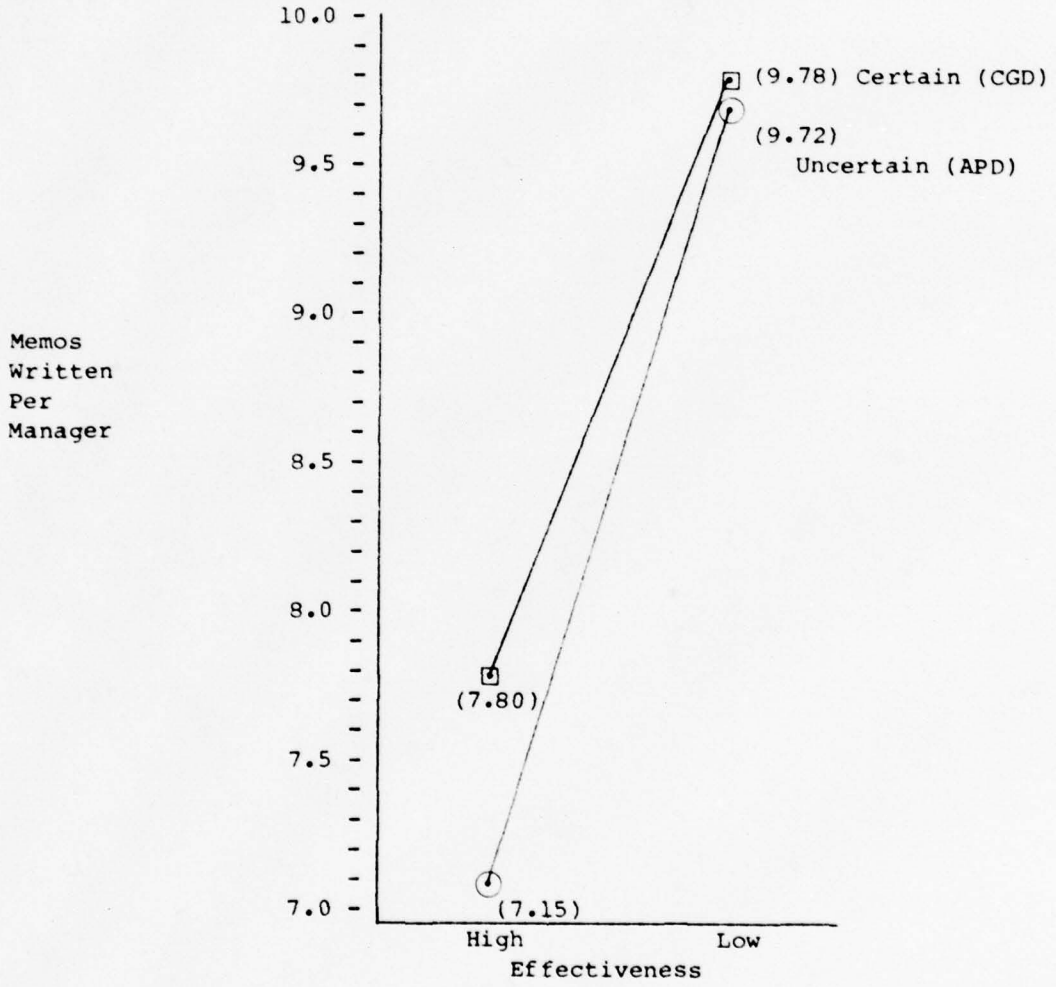
PERCENT OF TIME SPENT ON PAPERWORK



Source	ss	df	MS	F	P
Performance (A)	64.82	1	64.82	1.12	.31
Division (B)	7.53	1	7.53	< 1.00	.72
A x B	261.86	1	261.86	4.54	.05
Residual	922.46	16	57.65		

Figure IV-7

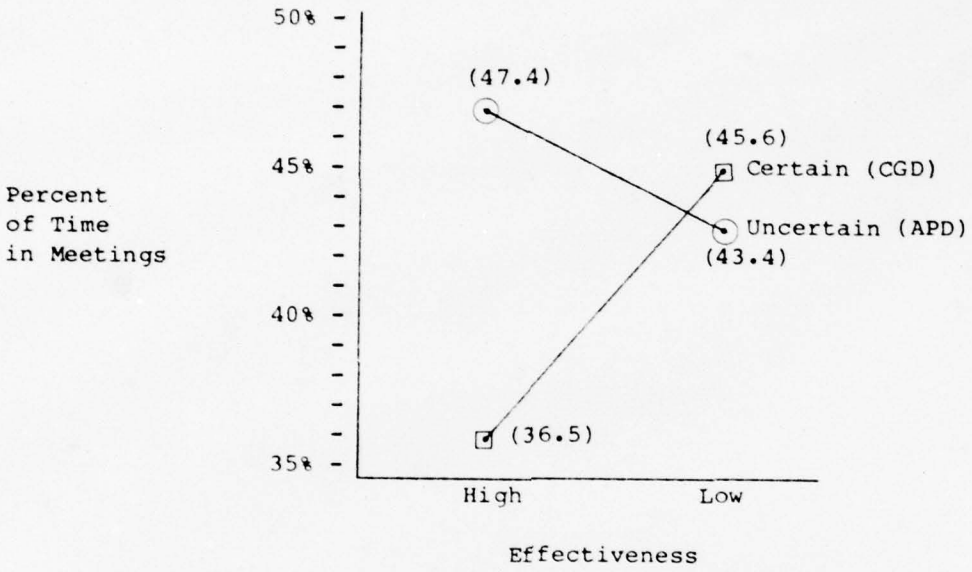
NUMBER OF MEMOS WRITTEN PER MANAGER



Source	ss	df	MS	F	P
Performance (A)	1102.50	1	1102.50	1.50	.24
Division (B)	215.60	1	215.60	< 1.00	.60
A x B	40.02	1	40.02	< 1.00	.82
Residual	11746.36	16	734.15		

Figure IV-8

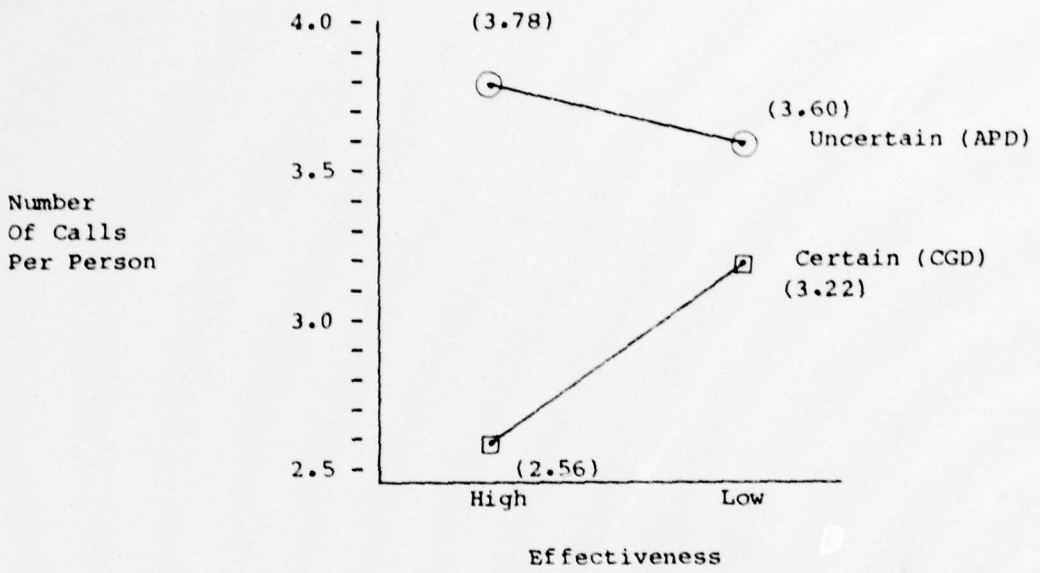
PERCENT OF TIME SPENT IN MEETINGS



Source	ss	df	MS	F	P
Performance (A)	29.64	1	29.64	< 1.00	.64
Division (B)	66.63	1	66.63	< 1.00	.49
A x B	209.06	1	209.06	1.57	.23
Residual	2136.83	16	133.55		

Figure IV-9

NUMBER OF PHONE CALLS TO NONLINE ROLES PER MANAGER



Source	ss	df	MS	F	P
Performance (A)	164.60	1	164.60	1.24	.28
Division (B)	261.90	1	291.90	2.20	.16
A x B	16.46	1	16.46	< 1.00	.73
Residual	2125.43	16	132.84		

Figure IV-10

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Appendix A

Looking Glass

Looking Glass is a 6-hour simulation of a moderate-sized manufacturing corporation. In each standardized run 20 participants are assigned to 20 top management roles ranging from President to Plant Manager and spanning 3 divisions. Their task: to run the company for a day in any way they want.

The simulation begins the evening before the run with a series of events designed to familiarize participants with the company, their roles, and each other. During this session, participants and staff are introduced, a slide show explaining the company is shown, participants are assigned roles and spend some time at their desks, and job descriptions and annual reports are distributed. This is followed by some time for the participants to socialize.

The following morning Looking Glass opens for business. Each participant spends the first 45 minutes at his or her desk reviewing an in-basket containing today's mail. Each in-basket contains 28 to 50 items ranging from the trivial (e.g., wine sale prices) to the significant (e.g., cost figures on plant expansion).

After the first 45 minutes, the telephone system is turned on and the managers are free to call meetings, send memos, place phone calls, etc. Using memo or phone, participants can contact anyone inside or outside the company. Trained staff play these "ghost" roles using standardized responses to the most commonly asked questions.

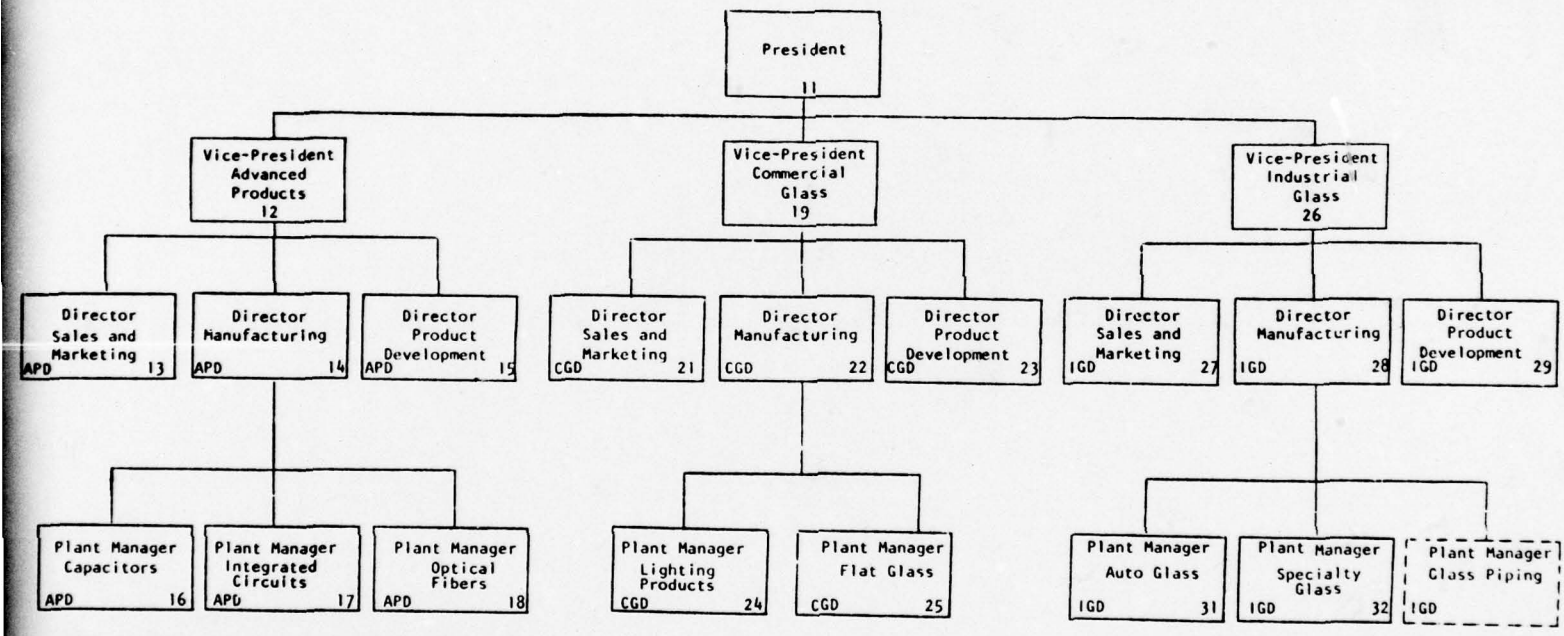
The simulation concludes with a brief address by the President and a lengthy session of filling out questionnaires. For all runs reported here, the simulation was followed by 1 to 3 days of training conducted by the staff of the participating organization.

The development of Looking Glass insured that a range of management problems and issues exist in the company. They cover many areas, including finance, personnel, legal, production, sales, R&D, safety, etc. Examples of the issues include:

- an opportunity to acquire a new plant
- deciding what to do with a plant that has lost money the last few years
- pollution and discrimination problems
- supply shortages
- production capacity limits
- a lawsuit with a major customer
- competition with foreign manufacturers

There are three divisions in Looking Glass, each of which faces a different kind of external environment. The Advanced Products Division (APD) manufactures products for the electronics and communications industries and exists in an unstable, highly volatile business environment. The Commercial Glass Division (CGD) makes light bulb casings and flat glass, and it faces a reasonably stable, predictable environment characterized by high-volume, low-margin products and well-established customer relations. The Industrial Glass Division (IGD) faces an environment containing both unstable and stable components because it makes products varying from auto glass (relatively stable) to space craft windows (highly unstable).

LOOKING GLASS, INC.



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Appendix A (continued)

APPENDIX B

INTERCORRELATION OF VARIABLES

	1	2	3	4	5	6	7
Time on Paperwork (1)	-						
Time in Meetings (2)	-.81**	-					
Time with Boss (3)	-.77**	.50*	-				
Time with Subordinates (4)	-.16	.24	.21	-			
Time with Colleagues (5)	-.61**	.81**	.24	.01	-		
Number of Memos (6)	.15	-.06	-.10	-.06	-.14	-	
Number of Calls (7)	.02	-.18	.26	.06	-.31	.02	-

$n = 20$
* = $p \leq .05$
** = $p \leq .01$

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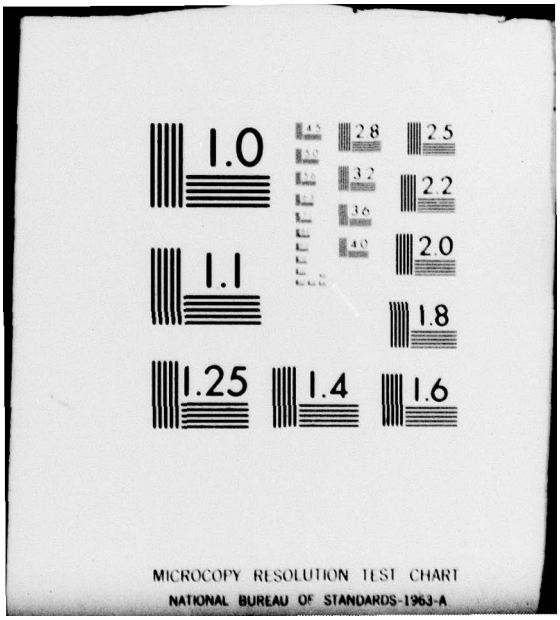
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